THE REPAIRING & RESTORATION OF VIOLINS.

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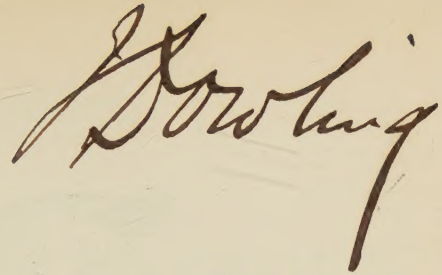

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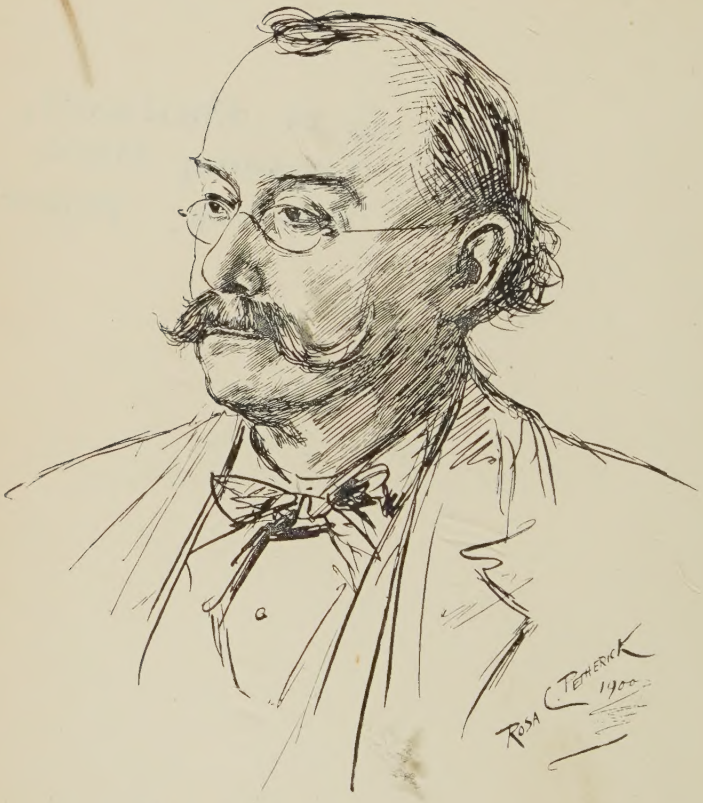

HORACE PETHERICK.

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THE

REPAIRING & RESTORATION

OF

VIOLINS.

BY

HORACE PETHERICK.

Of the Music Jury, International Inventions Exhibition South Kensington, 1885; International Exhibition Edinburgh, 1890; Expert in Law Courts, 1891; Vice-President of the Cremona Society.

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PREFACE.

AN ancient writer once asserted that "of making many books there is no end"; had the violin been invented and used as far back as his day he might have added, "and of repairs to violins," inasmuch as the number, nature, and variety of the damages that constantly occur and find their way into the presence of the repairer, are such as could not be counted and seemingly are endless. The readers of the following pages will therefore not expect to find every possible ailment to which the violin is liable, mentioned and its appropriate remedy marked out. If the more minute kinds of injuries are endless, they may yet be generalised under a limited number of headings, or in groups. It is with the hope that a sufficient number has been treated of, and the way of meeting difficulties pointed out plainly enough to enable the intending practitioner to follow on in the same lines, that this work is placed before the public. All the repairings referred to, have, with the accompanying annoyances and pleasures, been gone through by myself, and therefore the present little work may be taken as the result of personal experience and it is hoped may be acceptable to the readers.

H. PETHERICK.

July, 1903.

THE

Repairing and Restoration of Violins.

CHAPTER I.

Introductory.

THE art of the old liutaro of Italy may be said to have become during the last two or three centuries, identified with the art of constructing such musical instruments as are played with the bow.

As was the case with other and kindred arts, that of violin making had its rise in one of the old cities of Italy, where from small beginnings it gradually spread to other places and over the borders, until there are very few places of importance where it was not practised with some degree of success, commercially if not artistically and acoustically considered.

During the early period of the art, repairing was of a rough and ready kind, chiefly in connection with damages sustained under ordinary usage and accident; while extensive and costly renovating, such as is so frequently undertaken at the present day, must have been of rare occurrence, for the reason that it was then quite possible to get equal, sometimes better, quality in quite new instruments which were being sent forth every day by the resident makers. With the onward march of

time this has been changed; the art of the Italian liutaro having reached its climax some century and a half back, the masterpieces executed during that time are gradually diminishing in number and cannot be replaced by instruments having a sufficiently high degree of excellence; naturally enough the skill of the repairer has been more and more in requisition, so much so, that many who have shown exceptional ability for this kind of work have achieved a reputation for it alone, among the large circle of dealers in the principal cities of Europe. The necessities of the time have thus brought into prominence a modification of the art of the old Italian liutaro, in which there has to be displayed much more mechanical ingenuity if with very little or no originality; the high class of artisan has become strongly in evidence, while the artist has disappeared. It was in the consideration of these facts that the idea was first suggested that a work treating of the general methods adopted by professional restorers for important work, coupled with helpful hints in the management of minor injuries, would be interesting and acceptable to amateur as well as professional repairers, besides the numerous readers of THE STRAD, in the pages of which the following chapters were first issued.

In sending out the matter in book form, some alterations and additions have been, as usual, found advisable for completeness. All readers readily admit the impossibility of touching upon one half of the various accidents and ailments to which a violin is liable during its usually long life; the most likely ones have therefore been taken, and it is hoped that the suggested treatment of these cases may enable the repairer to become sufficiently adept for undertaking such others, serious, or slight, as may not have been here referred to.

Further, the author is hopeful that those readers who may feel indisposed themselves to put into practice the various hints, instruction, or advice, will be enabled by knowing how good repairing is carried out, to select the proper kind of person into whose hands they can safely intrust their cherished instruments.

CHAPTER II.

SLIGHT ACCIDENTS—MODERN RESTORERS—"CHATTERING"—THE PROPER SORT OF GLUE—ITS PREPARATION AND USE.

UNDER the above title (dry and unpalatable as the subject may seem at first sight to many) it is proposed to bring before the reader some deductions from observations in general, and particulars in detail that may be interesting as to the past, and suggestive as to the future. In the first place, the simple art of repairing a violin—and as for that, anything that has been fractured by accident or intent—will be in the minds of many associated with the presence of some strong glue or adhesive material, the right pieces to be attached, neatly or not, as the skill or experience of the repairer may be sufficient or available.

The nose or limb of a marble statue knocked off and lying in close proximity to the main body may be thought to give little or no trouble further than the collection of the fragments, the ascertaining of their original relationship, the spreading of a sufficient amount of strong cement over the raw surface and then pressing accurately into position; easy work to a person endowed with average powers of mechanical adaptation, under circumstances where the materials being of an unyielding nature retain their form for any length of time. But if any parts are lost different faculties and powers educated for the work are requisite and brought to bear on the subject. The

additions, besides the estimated proportions and form, must necessarily be composed of material differing in age, perhaps in quality, even when of the same supposed class as the original, and make further demands on the trained eye, both for discrimination of material and appropriateness for the work in hand. There will be lastly, but not least, the art of imitating old work, the consideration how far to go and when to stop in the dressing up of new bodies in an old guise so as to produce harmony of effect generally, and where possible in minute detail. Thus far concerning the repair or restoration of objects of art made from rigid materials, including hard wood carving.

Much ability, energy and patience have been expended on the reparation of ancient art work in which materials of various degrees of hardness and texture have been employed, and which require the attention of a restorer of extended knowledge and mechanical dexterity. There is in connection with all of this a kind of law keeping pace with the necessities of the hour. If the works of art of a perishable nature become recognised as more and more valuable during the onward march of time, they receive proportional attention from upper-class or highly skilled workmen. A costly work of art in need of repair or restoration is placed in the hands of an artificer whose reputation warrants the confidence of the owner. The works of art, however, with which our subject is connected, differ in important particulars from those for which gratification of the senses is to be favoured solely through the medium of the eye; they not only frequently demand the exercise of mechanical ingenuity of no mean order for purposes of restoration in regard to general appearance, but further and additionally, the no less important details concerned in a renewal, so far as may be possible, of their powers for the exhibition of acoustical properties such as were implanted in them by their original constructors. In the instance of a re-uniting of separated pieces, the insertion of fresh material to fill up spaces that must not be left open, strengthening, or even renewal of such parts as may have become worn away or—as is too often met

with—"honey-combed" from the inroads of those vandals of all time known as "the worm," all the supporting, rebuilding of the interior and re-decoration of the exterior must be taken chiefly as means to an end, that of the resumption of its rightful position among friends or rivals in the same line.

This restitution becomes of increasing importance and necessity every day, a condition arising from the verdict emphatically given by his majesty the public that there are not any instruments of the violin family ready to take the place—that is, worthily—of those made by the principal masters of Italy during the two hundred odd years before the commencement of the nineteenth century, and also that there does not seem to be much probability of others arising at least for a few generations to come. No wonder then that the most energetic searching has been going on for a long time, not only in Italy but over the whole of Europe, with the hope that in some out of the way court or alley there may yet be reposing in obscurity some long forgotten, unrecognised work by an old master of the art of violin making. Should one be unearthed, if but a wreck of its former greatness or even a portion, this is not refused but eagerly grasped and placed—not yet in open daylight before the gaze of the world, but in the hands of a specialist in re-vivifying these dry bones of a bygone age, re-habilitating them—perhaps having by him or given him other portions of a similar maker, or it may be—it has sometimes occurred—the actual missing parts.

The specialist in the repairing and restoring art is now not of the same class as in olden times. When the Amatis, Stradivaris, Guarneris and the like were being turned out one after another, there was not so much necessity for preserving all the pieces or splinters of precious pine that had been separated by the fracture of the upper table from any cause, there was a better remedy at hand, the nearest maker would naturally be sought whose reputation was possibly more than local and whose self confidence prompted him to make a fresh table rather than devote time and labour for which adequate com-

pensation could not be hoped for. As a result, we frequently find old violins and their kindred turning up with fronts and backs which, although fitting well as regards size and outline, have been made by a distinctly different workman, in some instances equal or even superior to the originator. At the present day, however, this kind of restoration is much more rarely attempted and is not resorted to unless the damage is very extensive or vital portions have been irrecoverably lost.

The modern maker has no longer within reach, pine with requisite acoustical properties, of which the old Italian masters seem to have had so large a store, or if not, the knowledge where to obtain it. As a consequence there has, in response to the pressure of necessity, arisen a class of workmen some of whose dexterous conversion of a mere bundle of splinters of an old master into the semblance of its former grandeur of aspect would have astonished the original designers. These modern restorers are not to be confounded with the minute imitators or forgers, than whom they are much more clever, hard-working and honest withal. The art of repairing and restoring has now become so distinct from that of making, that many in the foremost ranks in the increasing large army of restorers may never have made a violin throughout. The faculties, skill and experience directed on the restoration of a violin "on the sick list," differs from those exercised by the first constructor whose mechanical dexterity is an aid or secondary to other qualifications: whereas it is paramount in importance in the constitution of a first class repairer.

The construction of a violin from beginning to end may be said to be an art based on certain fixed principles, not all of them known, however. When these are, as far as possible, acted upon by a workman of sufficient intelligence and training, the progress of the work may be considered as being in a fairly straight and open course. Not so with the restoration of it after fracture or loss of parts great or small, several different courses may be open as to treatment and this will be as the temperament of the

restorer will suggest or the exigencies of the moment may demand. Temporary alleviation of symptoms—how to make the thing go somehow—when there is no fiddle physician within beck or call, is a problem frequently arising and very annoying, necessity then being the mother of invention, often of a most curious sort, as most professional repairers who have had the re-consideration of the matter will have impressed on their memories. Among the most frequent of simple ailments the fiddle tribe is subject to, is that known as "chattering" or jarring, caused mostly by some parts having become dis-united, perhaps through damp or accident sometimes of a most trifling nature, and which henceforth, unless remedies are at once applied, make themselves evident in this way, accompanying every note that happens to be in unison with themselves, and lending discord instead of harmony, expressing urgently their thirst and desire for a small drink from the glue pot. Not unfrequently the exact spot where the jarring or chattering takes place is not easy to find by mere examination of the exterior, especially if the separation is fresh and at a part where very little adhesion has taken place at any time, or possibly the very slight portion of glue originally placed at the time of construction, has, with the progress of time, gradually dried away. Should this have occurred at the junction of the upper or lower tables (most frequently the first), the sides, or ribs, the exact spot must be found by gently tapping all round carefully, holding the instrument meanwhile firmly at parts that are least likely to have become disconnected or that are known to be perfectly sound. The tapping or sounding can be done in the way usual with dealers and repairers, that is, by the knuckle joints of the hand rapping round the instrument, but this is sometimes deceptive, the tendons over the bones of the hand interfering and occasionally causing a double sound, and so defeating the efforts at discovery. A more delicate and therefore better means of testing is by the use of a felted hammer of the kind and size acting on the bass string of a grand pianoforte; this will be found very

handy. Should the rapping or sounding all round the border not reveal any weak spot, we may be sure the seat of the complaint is to be sought for elsewhere; possibly there is looseness in the interior and therefore something requiring deeper consideration.

We will for the present assume that there has been no uncertainty in locating the weakness, and that it is at the part before referred to as the most frequent in showing signs of disorder—the upper table losing its grip on the ribs. This is one of the many common ailments that are teazing to the violin during its troublous career; a slight accidental tap, or hastily putting the instrument to rest in a too closely fitting case being often sufficient. Sometimes, on the reverse, it is from being in too large a one, getting well shaken while being taken home after some orchestral rehearsal; the joy of having mastered Mozart or battered Beethoven for an evening is turned in the morning to grief and vexation, when in response to the gentle persuasions of the bow there are but chatters and jarrings. Under such circumstances the treatment administered by the hands of non-practical or inexperienced people is akin, more often than not, to that popularly supposed to be effectual in suppressing slight functional disorders of the human system; namely, a prompt and appreciable dose of medicine for the one, a good stuffing of thick dark glue for the other. In both cases it may well be said that not unfrequently "the remedy is worse than the disease." Glue is a good thing in its way and when properly applied, but not so if overdone, even if the kind is the best obtainable.

A few remarks may here be offered as to the qualities that should be present in good glue, especially with regard to violin repairing. Among the makers of it, the glue which will absorb the largest quantity of water ranks as the best. It will, after proper application, resist best the action of moisture in the atmosphere, or in fact take longer time before releasing the two surfaces it may have been holding in contact. There is not much difficulty in getting glue very satisfactory in most respects—as good animals die

now-a-days as ever got into the gluepots of the old masters—but it must be selected. That kind used extensively in the German manufactories is said to be a fish glue, remarkably hard, very light in colour and almost opaque. This is not to be recommended for violin repairs; it holds the parts together with such tenacity that fresh fractures are likely to be caused in undoing a portion, a process often very necessary; professional repairers will tell you "it tears the wood too much." The glues mostly in favour among upper class repairers are those known as Russian, Cologne and Isinglass, all good; they are light in colour, very firm, not too brittle, and transparent. There are other varieties to be had of excellent quality and which conform to the conditions required. Thick cakes of a dark brown colour with an unpleasant odour should be avoided; they are too easily affected by the atmosphere, turn bad in the gluepot under very little provocation from damp warm winds, and spoil the look of good and refined workmanship. There are many different kinds of glue sold under various titles, some termed "liquid glue," others cement, apparently for saving the very insignificant time and trouble in warming up the orthodox solution; but none appear satisfactory in general and many of them are even detestable. There are some adhesive materials used in India where warmth and damp have their full play and make short work of an old master's joints, but these cements of the Eastern Hemisphere are likewise unsuitable for the kind of work under consideration, as when once dried, being unaffected by damp to any extreme, they are of course difficult to remove when further repairs have become necessary.

One of the special advantages of glue to the repairer is its yielding to the direct application of moisture, so that in future repairings the old stuff can be washed completely out and fresh glue used over clean work. Let all amateur repairers therefore, abstain from seeking after a vain thing of the nature of glue impervious to moisture. One word more, as preachers say, and that is as to the

preparation or melting of the glue—simplest of processes—some pieces of selected glue put into a small glazed gallipot with two-thirds of clean water and left to soak during the night will only require warming in the morning by placing the pot in a larger one and surrounding it with hot water. The quantity of glue being varied according to requirement is far preferable to the old-fashioned iron glue-pot which darkens the glue and is in other ways objectionable. If the injury or want of adhesion extends only to a trifling distance round the edge and has happened at a time when good glue and proper appliances are not to hand, the routine pursued must still be the same

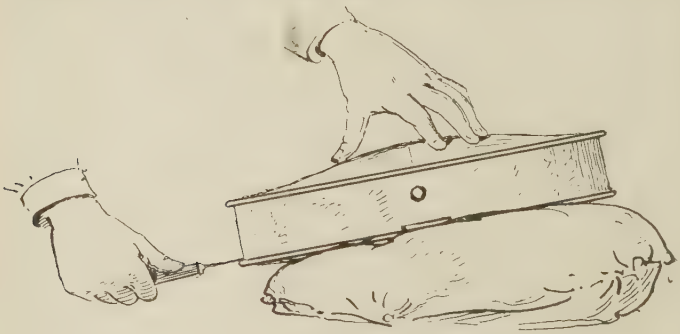


Diagram 1.

as if they were; first by obtaining a well-worn table knife, the thinner the better (but if the household knives happen to be new and strong you may call on some artist friend, borrow his palette knife, clean it, have ready some clear water, a cushion or a substitute, and some rather thick gum). If time will allow, the strings should be taken off the violin, and then placing it face downwards on the cushion, the knife having been dipped in the water, can be inserted gently at the part requiring attention. (Diagram 1.)

You will soon tell by the sound in moving the knife about whether the separation has been recent or of long

standing, if the latter, the slipping of the knife will cause a slight grating sound and when drawn out will show signs of dirt. The knife must be rinsed and re-inserted a sufficient number of times until all the evidence of dirt has disappeared, the knife coming away clean and not gritty. Care should be taken meanwhile to keep the violin on the tilt so that the water introduced on the surface of the knife does not run inside but outward to the edge; the parts should also each time be wiped by a clean absorbent piece of cotton or linen. The knife can then be charged with gum instead of water and inserted as before, the process being finished by the wiping.

DIAGRAM 2.

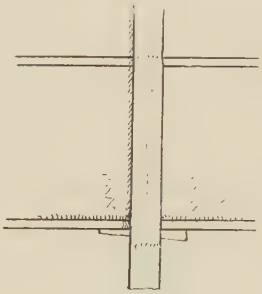


DIAGRAM 3.

But now the question will arise how about the closing up and pressing together of the parts. For this, assuming that the part to be rejoined is not of great extent, the chin-rest—almost every player now uses one—can be applied to the part and fixed in the usual way. If there is not one to be had, some pieces of ordinary deal, the softer the better—fire wood will do—cut into shape as depicted (Diagram 2) can be fitted, but very loosely to allow of thin wedges being used to tighten the grip (Diagram 3). They must be very gently pushed in, or the border of the violin will be damaged. Some paper placed between the wedge and the border will help in

preserving the latter from injury or marks. The above suggestions are only intended to be applicable when the violinist may be out of reach of any professional or competent repairer. Gum arabic or dextrine are not comparable with good glue for repairs, although with care and attention to the details enumerated here I have known it answer when in pressing haste, and even for a permanency.

CHAPTER III.

Minor Repairs—Cramps and Joints—Violin Cases—Rattles and Jars—Loose Finger-Boards—Atmospheric Temperature — Old-Fashioned Methods of Repairing—Modern Ways—A Loose Nut.

THE professional repairer is of course always provided with the well known wooden screw cramps as used in all countries for centuries, but if "up to date" men, they will have affixed the modern covering of cork or leather at the parts coming into contact with the instrument. No end of damage has been done at all times by neglect of this simple precaution. Many gems from the old masters that would otherwise have been matchless, are disfigured by an array of semi-circular dents or bruises near the border. This is particularly noticeable when the arching springs rather abruptly from a narrow channel and near the purfling, or the rise commences from the border without channelling. Here is shown the wisdom of the earlier Italian masters when introducing the channelled model, the hollowing being a preservation against damage by the impetuous repairer. Many otherwise excellent workers are heavy handed, pressing all parts together very tightly but not more securely. Good joints, cleanly and accurately cut, the surfaces kept clean and not overloaded with good glue, are the best for lasting, and of course for appearance.

Before leaving that part of our subject which is

connected with damages to the violin resulting from want of precaution or thoughtlessness, it may be as well to refer to a frequent cause of disaster, often well nigh ruin, by the use of badly fitting and badly constructed cases. Innumerable as have been the varieties of style, shape and arrangement of violin cases, there is still an opportunity for a new, good and useful one that shall combine all or most of the requirements as regards utility, portability, preservativeness and nice appearance. Those in use for travelling with during the last century and the early part of this, had the disadvantage of heaviness, besides their rounded forms which prevented their being placed with a flat side downwards on a shelf or convenient horizontal surface without some unsteady rolling; also being often studded with brass nails like a coffin, a very grave objection (diagram 4). The leather cases which

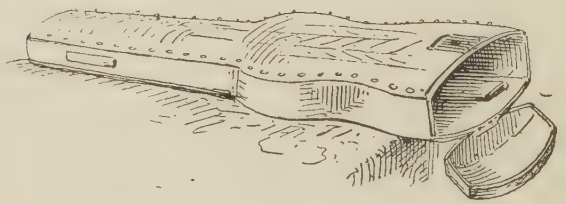


Diagram 4.

require the instrument to be placed in sideways have the advantage of giving good protection against rain, but there is insufficient defence against accidental violence; they are, further, more expensive than the foreign boxes made of poplar wood, which are light and of sufficient strength when carefully made. There was one good thing about the ancient cases, however, the violin being inserted at the large end, the performer knew at once whether the case was sufficiently capacious for the instrument. Not so with those in common use at the present time, opening as a box. To these may be laid the charge of causing an

immense amount of irreparable injury to numbers of violins of any standard of excellence or costliness. This in the way mostly of depressions—"wells" as they are termed by repairers—where the feet of the bridge rest. These are caused by the lid of the case coming down on to the hard wood of the bridge and pressing its feet like dies, into the comparatively softer pine (diagram 5). It

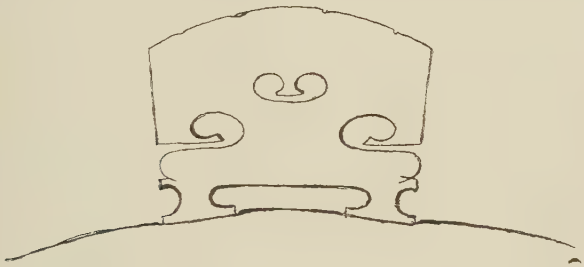


Diagram 5.

is a disfigurement to the violin and is sometimes in a bungling manner altered by inlaying—badly in most instances—square pieces of wood to bring the surface level. This kind of damage to the violin has been attributed to the prolonged pressure on the upper table by the strings being stretched up to modern pitch, but this is a mistake, no strings at all playable would press sufficiently hard and directly downwards to produce this result. The double-cases in use are worse than the single, as they are necessarily stronger and heavier. Both present the same difficulties in estimating whether the violin with its bridge is too high for the roof inside when the lid is closed. A good way of testing it is by rubbing a little soft white chalk over the top of the bridge and then gently shutting the lid down, which also should show no indisposition to do so; if on lifting the lid any of the white chalk is seen to have changed places and got on to the lining of the lid, put aside at once and for ever

the condemned case as being an unfit receptacle for your cherished Cremona. Further, if the fit is at all tight, do not use pressure but get another case, your violin would be a very bad one indeed for your sympathies to fall in with a horrible suggestion once made by the maker of a too closely fitting case for his friend's instrument, that he should be allowed to take a shaving or two off the violin, it would then go in nicely. As some excuse for this maker he was not an amateur in this line, but a professional undertaker.

We may now shift our ground and notice another source of the complaint—rattles, jars, chatters, or grunts, which ever may appear the most appropriate title for another variety of annoyance to the performer. Having found out with our felt-headed hammer, or if that is not easily obtainable, a slender stick may be covered at the end with almost any soft material enclosed within a piece of chamois or soft leather, and tied so as to form a knob like a small drumstick. Having tested the violin with it in the manner before referred to, and there being no bad reports from the body of the instrument, the hurt, seat of injury, or lesion, may be in the neck, fingerboard, or even the scroll, any part being liable to give out its undesirable note, or interfere with the proper emission of musical tone from the strings. There is no portion of the violin that will not under certain provocations join too willingly in the production of unwelcome sounds if the exciting conditions are present—those of checked vibration, or vibration that should be checked. An unsuspected cause may be discovered by the tapping test to be lurking unseen, and often unfelt, till one note being struck in unison or sympathy with the affected spot, may cause it to speak in a decided manner. This is at the part where the fingerboard parts from the neck over the instrument towards the bridge—the rather thin glue, as it should be—may, through damp or other causes, have lost its hold for but a short distance, and not be evident while the fingers are pressing the strings over the part; but when notes are struck nearer towards the nut, the pressure is

relieved and the fingerboard free to take its own part. This, although a trifle in itself, requires for its cure proper attention with suitable appliances.

After the removal of the strings, the first suggestion naturally occurring will be to insert, with the blade of a knife, some glue and leave it to dry. This is more likely than not to make matters worse, as it should always be borne in mind that glued surfaces always require pressing together, however well they may fit. Glue contracts as it dries, and in the process apparently disperses and clings to any other bodies rather than to itself. To put this in another way, if air is allowed to insinuate itself between the two surfaces which it is desirable to bring into closest conjunction, the contraction, particularly if good, while in progress, will cause a separation in the central mass of the glue, while the two surfaces will be left as before, independent of each other, but more clogged. Pressure must therefore be invariably brought to bear behind the opposing parts, so as to drive out the air from between and prevent its re-admission—the necessity of an exact correspondence of the parts will be obvious—at the same time the glue is to some degree forced into the pores of the surfaces, and when the moisture has dispersed among the myriads of cells composing the structural growth of the wood and finally evaporates from the external ones, the glue, having hardened, will hold the parts together with a tenacity that can only be overcome by prolonged application of moisture or actual destruction of the parts.

There is one very important consideration in connexion with glueing operations that must not at any time be lost sight of—that of atmospheric temperature. Much trouble may be brought about by inattention to this help or obstruction, for it will act both ways according to circumstances. In the glueing of important parts in the construction of pianofortes, the operators are careful to have the temperature of the surrounding atmosphere sufficiently elevated, as well as heating those portions of the structure which are to be accurately and lastingly joined, and particularly where hard woods and smooth

surfaces are brought together. The violin repairer must strictly follow the same rule. The degree Fahrenheit at which glueing operations are best conducted may be roughly estimated as nearly seventy. The reason for this is that the nature of good glue is to coagulate or "set" rapidly in a cool atmosphere and in this state—not perceptible at once to the eye—it will resist a considerable amount of pressure, the surfaces that should exactly cohere, slipping aside and the whole work having to be done over again, perhaps with fresh damage.

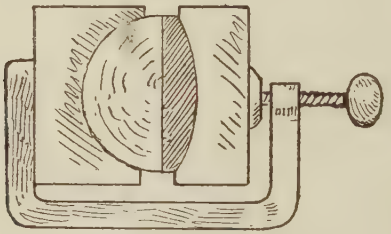


Diagram 6.

To return now to our loose fingerboard, an old fashioned and very clumsy, inefficient way of fastening it after glueing, was to tie some string round it, which of course getting much glue upon it during progress had, when dry, to be torn or washed off. The modern, simplest and best way is to have ready a soft wood mould with a square or flat back for the under or circular part of the neck, and a similar but flatter one to fit above on the fingerboard. These can be easily adjusted, and the requisite pressure obtained by several screw cramps along its extent (diagrams 6 and 7). It is not very often that the nut or small block over which the strings pass on to the pegs gets loose, if it does, it is the result of bad fitting and careless glueing. If it should happen to come away, wash

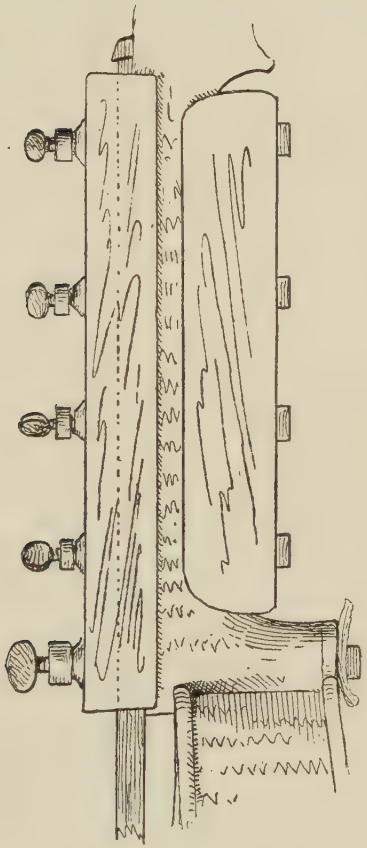


Diagram 7.

it, and when dry see that the under part to be stuck to the fingerboard and the neck is quite square and level; warm it and apply some strong glue to the two surfaces, and also to the parts with which it is to come into contact, you can then place it in position; press down and rub backwards and forwards once or twice, then leave in the exact position required; if clean, accurately fitted and warmed, it will not require any further pressing or clamping. If this part should have been knocked off and lost, then a new one must be made. For this purpose the hardest piece of ebony you can obtain is the best; sometimes a nut of ivory or bone is used, but it has a staring effect, although if properly done as above described, it holds well and wears slowly. Some of the hard dark woods, cocoa wood and lignum vitæ, or dark horn are adapted for this purpose. Rosewood is not so well suited, as the ruts or grooves are soon made deep by the friction of the strings in being wound up, and renewal is found obligatory sooner than with the other.

Having selected a suitable piece of wood it must be cut or planed square and equal in thickness. It should be as nearly the right length as possible before being placed permanently in position, the ends being very tough in cutting. If by miscalculation they are found to project over the width of the fingerboard, they should be—when the glue is quite dry—cut through with a small bow saw close up, a gentle, careful filing will reduce them down level with the side of the fingerboard; the surface should run easily with that of the peg box, which is not always of the same width as the other, the arching can then be proceeded with, a chisel being first used, then a rather close grained file for further levelling and the finishing off with the finest glass-paper or emery cloth, having a drop or two of oil in it; this will give a smooth, dull polish agreeable to the eye. The grooves in which the strings will have to rest must be marked out or pricked to measurement so that the spaces may appear regular when the violin is strung up. The distance apart being occasionally done to the caprice of the player, measure-

ment should be kept of this matter of detail from some well regulated instrument as a standard to go by. When the exact spots for the grooves are marked or pricked, a very small, round or "rat-tailed" file may be used to work the wood down at the spot, care being taken that the file is constantly held in an exact line with the direction of the fingerboard, otherwise when strung up the appearance at the part will be that of distortion and the string will even be checked in its freedom in passing through the grooves, each of which should be made to receive the string not too tightly nor too loose. Of course the width of each groove must be in agreement with the thickness of the string, the widest being the D, the G a little less, the A less still and the E least of all; the E should be a trifle closer to the fingerboard than the D or G, the last, having the widest swing during play, should be raised further off the board than the others. The arching of that side of the nut may also be left a little higher. The nut should also be made to slant down towards the peg box (diagram 8), the grooves being of a regular depth on this and not deeper at the top (diagram 9). When all is ready for the stringing up, a soft lead pencil may be used for blackleading the grooves, they are otherwise liable to arrest the progress of the string towards the pegs when tuning up and suddenly letting them go with a click, making the tuning uncertain and difficult; if the wood is rather obstinate—it is not always alike—a touch of beeswax of the size of a pin's head where the lead is placed will be an effectual cure.

We may now leave this as finished, going to the other end of the violin where another nut is used for supporting the tail-string as it comes over to the end peg. This part is frequently done in a slovenly way, even by some repairers of good repute; there is no reason why it should not be as neatly done in all respects as any other part. It may be that the supposition is uppermost in the mind of the repairer that, like the nut at the fingerboard, the pressure of the strings will retain it in position. This is a mistake, there is a great pull forward, especially if the

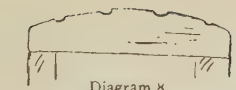
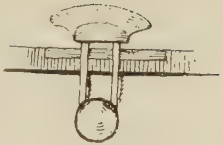


Diagram 8

Diagram 9



Oldest Form of Nut
Diagram 10.

Diagram 11

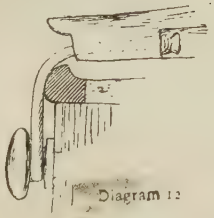


Diagram 12

Diagram 13

Diagram 14

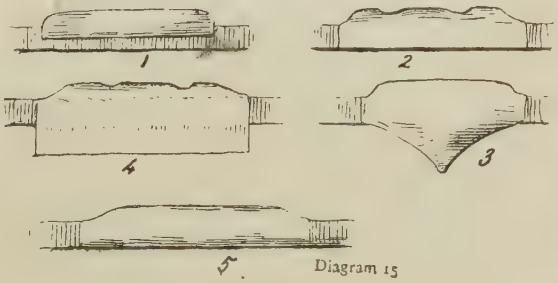


Diagram 15

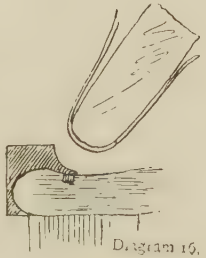


Diagram 16.

Diagram 17.

Diagrams 8 to 17.

wood is hard and dry. The material should be selected for its solidity and hardness like that for the other nut. In olden times, say those of the early Italians, this part, owing to the small amount of strain in consequence of low pitch, low bridge and short neck, seems to have been treated with almost indifference, a very slight piece of ebony, cherry, pear, or other variety of hard wood found in Italy, sufficing for the purpose (diagram 10). It was left level with the surrounding soft wood, or nearly so; there was no occasion for raising it at the time, as the tail-string projected from the underneath of the tailpiece instead of that almost universally now known as the secret tie (diagrams 11 and 12). This latter necessitates the use of a higher and more substantial nut, otherwise the tailpiece would be close down to, if not touching, the table, causing a rattling. Further, in accordance with mechanical law, the strain or pull forward increases with the height of the nut. It is therefore obvious, that unless well fitted and held strongly, the nut will be liable to be wrenched forward out of position. This is more frequent than would be suspected, and is sometimes a secret source of damage or bad influence leading to disaster in other parts of the instrument. The same observations concerning the preliminaries apply to the fixing of this as to the other nut. The modern arrangement of the part leaves but little to be improved upon.

The length and thickness of the nut required having been determined upon, we will suppose ourselves in the presence of an old worthy from Cremona requiring a fresh attachment, the wood selected—Mauritius ebony for preference—and the measurement as follows, $\frac{5}{16}$ in length and thickness according to the width of the border, as the nut looks best when the inner edge runs in a continuous line with that of the purfling (diagram 13). In highly finished work and when the end of the violin has a perceptible curve instead of being nearly straight, the nut should be made to follow the course of the purfling, this will require some care in the cutting and finishing of it. For this a piece of almost any veneer cut

to the exact flow or drawing of the line may be used as a guide or template. The block from which the nut is to be made having been cut quite level, the line can be traced with a fine pointed pencil, or better, a fine pointed knife, and then shaped with a sharp chisel. The block or nut can now be laid on the border, care being taken that the tail pin comes immediately in a central position in relation to it, and then with the sharp pointed knife a finely cut line can be traced all round. The space now marked may be cleared away down to the top of the end block with a clean, vertical wall on three sides formed by the pine. If carefully done, the nut, at present only a solid, squared block, will fit exactly, if too tight, a little shaving off here and there of the pine will correct it. The nut, supposed to be an exact fit, may be warmed and some fairly strong glue applied (diagram 14). The raw surfaces of the pine and the exposed end block are of course very absorbent and require an extra feed or two in order that the final glueing of the nut and place of reception may have a good holding. The nut, now squeezed into position, will not require the clamp, but if time is no desideratum an application of that useful tightener will ensure a firm hold, and moreover the superfluous glue is forced out.

When the glue has had time to thoroughly dry and harden, the clamp may be released, and a part at each end of the nut marked off for levelling down to the surrounding forces by filing and glass-papering. The manner and care with which this is done declares the excellence and characteristics of the workman or firm by whom he is employed; almost every repairer or house of reputation having their individualisms in this respect, as also in that of the fingerboard nut (diagram 15). A line having been ruled with precision along the upper central part with the pencil or knife as before, a small gouge can be run along a hollow which will face the bridge. To give this the best kind of finish a piece of pine or soft poplar, such as is used for champagne wine cases, you may look out for one about Christmas time, cut it to the shape of the part

to be finished thus (diagram 16), and with a piece of fine glasspaper, slightly oiled, a few rubs backwards and forwards will be necessary. The top of the back part can now be shaved gently down by a small metal plane, a little filing will give the evenness and rotundity required. The same treatment will be necessary for the under part, which in good work is a continuation of the line of the edging of the upper table. A section of the nut in its finished state will be as in diagram 17.

The whole of the surfaces may now be finished with the finest emery cloth and oil. This latter may be linseed, nut, poppy or castor oil with turpentine, but do not use sweet or olive oil, it never dries, but lurks about in the pores of the wood and turns rancid.

Before leaving this part of the instrument, it may be as well to take a glance at the peg itself and its insertion at the centre underneath the nut. This is in no respect an unimportant detail to be seen to in the fitting up and regulation of a violin. In olden times the peg was small, not half the size of those inserted in new violins of the present day. The increase in the size seems to have been gradual and to compensate for the hard wood of the peg pressing against the inner, softer substance of the end block with the thin slice of maple used for the ribs, both being insufficient to withstand the strain of the tail-string. Consequently the peg is pulled upwards, sometimes considerably out of position. This is especially likely to occur if the hole has been bored too large or the peg is too thin or short. The accurate fitting of these should have strict attention. Some modern repairers, when they find that there are indications of a softer piece of pine than usual having been used, enlarge the hole with a tool specially made for the purpose, having two cutting edges, or with a number of grooves having sharp ridges, others a rat-tailed file. The latter is perhaps the best, as being less likely to split the fibres of the soft pine. The tool is inserted, not directly in a line pointing exactly midway between the upper and lower tables, but slightly upwards or contrary to the tendency of the peg to

accommodate itself to the strain. When the parts under strain have settled down, the peg is seen to be as near as possible horizontal with the length of the violin. The best way, undoubtedly, is to make the peg an accurate but not too tight fit, it should be sufficiently long to go right through the block. In cases where the hole has been enlarged, badly directed or even made ragged by a bad tool, it should be a stopped up very carefully with a plug, neatly glued in, and a fresh hole bored. Sometimes this has proved necessary from the carelessness of the original maker. The old masters were not always exact with their mechanical fittings in connection with the violin. The moderns, for obvious reasons, have paid much attention to them. I remember coming across an Italian violin that had changed hands frequently for the asserted reason of insufficient tone. The maker having a renown for considerable power, it appeared to me that the tone was possibly there, but that from some undiscovered cause it was not properly emitted. On examination I found that the maker had joined the ribs, not at the central part as usual, but too much to the left, perhaps a pupil or assistant had bored the hole at the junction. There were besides, some tinkerings by modern regulators endeavouring to counteract the uneven strain over the instrument. The right spot, or it may be called the axis of the instrument, having been found, the peghole was neatly and permanently plugged, and a fresh one bored, which allowed the strain to be better distributed. The result was satisfactory and delightful; the tone of much power and purity had free play in manifesting itself, and the violin was enabled to take its rightful position among its brethren. A few words as to the right spot for the peghole. This was treated by many of the old Italian liutaros as a matter for mere guess work apparently, when there was no join in the upper table, nor in the lower one, sometimes the lower rib being continuous. The best spot, and therefore the right one, may be fixed upon by finding the centre between the two inner edges of the purfling on the upper table at the lower part, the same

between that of the upper, and drawing a faint line through the points with a piece of soft white chalk cut to a point, and guided by a flexible rule or straight edge down to the nut. If this line does not touch at the centre of the nut, then the latter is out of place, and it should be rectified. The line should pass through the centre of the nut, and immediately underneath this and midway between the edges of the upper and lower table will be the spot for the centre of the peghole. The line thus made will not always be found to agree with the centre joint of the pine; many of the old Italian makers may have not, from lack of wood of the right sort and in equal widths, been able to do otherwise. At times it may have been carelessness. Some of their roughly made violins have the joint line over a quarter of an inch from the centre, occasionally it will be not only wider on one side than the other, but the thread or grain will diverge instead of running parallel with the centre line. The judiciousness of careful measurement for the centre, instead of relying on the joint line, will therefore be obvious. There is not much to be said in preference of one kind of hard wood over another for the end peg, it being a matter of fancy as to appearance. Ebony being black and very hard, should perhaps take the preference in wear, and acquiring a polish from the gentle friction it is liable to. The old Italian end pegs were mostly of cherrywood, with lines neatly turned round a centre of ivory or bone.

CHAPTER IV.

Injuries to the Head or Scroll—Insertion of Fresh Wood—Colouring of White Wood—Separation of Head from Pegbox and Rejoining—Stopping Material for Small Holes or Fractures—The Pegbox Cracked by Peg Pressure.

LEAVING this part now, we can turn our attention for a time to reparation of injury to the head or scroll. This interesting and often highly artistic part of the general structure of the violin, and in which no man since the time of the old Brescian, Gasparo da Salo, has succeeded in effecting any permanent change of fashion, is subject to as many knocks as any other part. A piece out of the ear or first turn from the axis is, with a delicately carved scroll, so frequently seen as to be almost fashionable; little pieces out of the edges further off from the central part, are common disfigurements. Modern vandals rub these parts down with a file or glasspaper, to make it nice and even to their vision, saving themselves time and trouble. Many a graceful scroll, carved with loving care and enviable dexterity by a master of his art, has thus come to an untimely end. Should your cherished Guarneri or Stradivari scroll got chipped or fractured by accident and the piece drop, search for it at once, and when found, if you have not good mechanical ability and experience in fitting such delicate parts, it should, while fresh and free from soiling, be entrusted without delay to the care of a professional repairer of repute, but not to a

provincial amateur or rough carpenter who would probably make matters worse. On setting to work after a preliminary inspection, the careful repairer will fit the parts together as they are, to ascertain that there is nothing to prevent a close join of the surfaces, sometimes a splinter will prevent a close fit of the surfaces ; this must be pushed into its right position or, if in the interior, it may be better to remove it altogether. If the part is lost, then the bare space must be carefully examined and the direction of the grain and quality of the surrounding wood matched as closely as possible ; otherwise the most accurate fitting and finishing off will not make a good restoration. The repairer of experience will have at hand a large quantity of odds and ends of different kinds of maple, curled or plain ; perhaps old worn out necks or otherwise useless fragments of relics of a bygone age, and not necessarily of musical instruments. But sometimes these are not to be obtained, nothing but new or modern wood, and it may be of good appearance and applicable excepting for the colour. What is to be done ? There is the drawback to new white wood, that it is difficult to colour down to match the surrounding wood, when it has been fixed, and besides, if the part happens to be where there is any friction, the white wood soon makes itself apparent, if not very conspicuous. It is advantageous, therefore, to colour the wood artificially before placing in position. There have been many ways adopted at times for meeting this requirement. It must be remembered, however, that there is no perfectly successful mode of artificially colouring wood so as to defy detection, but small portions such as are under consideration at the present moment may be treated so as to look tolerably well. Firstly, a well known, often tried, but very bad method is to steep a piece of white new wood in a solution of nitric acid and water. When dry, old age will seem to have crept over and through it, but of a delusive and unnatural kind. The corrosive properties of the acid still remain and gradually disintegrate the fibres until the whole mass becomes rotten. It may be fairly termed premature old

age, as the lowering or toning down of the colour in wood and other materials seems to be caused by similar, if not identical, constituents of the ordinary atmosphere, but under different conditions. Another way is lay the pieces of wood upon a stove with a regulated heating power and watching for the exact degree of change in the colour with continued heat. There is very little to be said against it for small repairs, the degree of heat required for the desired tint is insufficient to damage the wood but enough to harden it, and if not too hastily done the colouring will go quite through.

Among other methods is tinting the wood by any of the various stains sold for the purpose. Few of them are of any good to the violin repairer, some choking the softer parts and leaving the harder ones or threads standing out lighter when they should be darker. Their colour, if it were not for this drawback, is sometimes good. Some of the manufacturers of new musical instruments on the continent lower the colour of the wood before varnishing by staining it with a solution of bichromate of potash. Sometimes when dexterously applied the colour is very good, but the stain is liable to make itself too evident in parts where the wood may be a little more spongy than at others. Most of the instruments treated in this way may be recognised at a glance, the curl of the maple is brought out strongly, in fact overdone. With small portions of wood for repairing this stain may, with much caution, be used to advantage. It has the property of throwing up the threads of the pine and the nutmeggy parts of the maple without impairing seriously the clearness of the grain under the varnish. The preparation of the solution is as follows—some pieces of bichromate of potash can be put into any ordinary bottle of a convenient size and water poured on to them. The water will take up a certain quantity in solution which will be too strong for the repairer's use; some of it, say a gill, can be put into an equal quantity of clear water, and then painted over the wood to be coloured down. There will not be any perceptible colouring for half-an-hour or so, but further

exposure to good or strong sunlight will gradually bring about a change from the slight orange tint to the dull light brown approaching that produced by the slow secret process adopted by "Old Father Time." It must be kept in mind that bichromate of potash is a poison. There are other stains that will bring a good colour to the surface of the wood, but are likely to change colour when the varnish is applied. The whole work of careful restoration may thus be upset in a moment. All stains should be carefully and repeatedly tested before being applied to any work of importance. Some repairers use a hastily made solution of powdered colour such as burnt umber, and paint or rub it into the wood. This process is to be condemned as resulting in opaqueness and giving a tinkered aspect to the wood and work.

There are doubtless many substances or liquids capable of imparting a tint resembling that alone caused by age, but experience only will enable the repairer to decide which is best. It may be as well to point out that some tinting substances are more suitable for colouring wood of a dense quality than for a more open grained or spongy one. Much will depend on the judgment exercised and skill in matching tints. When it becomes absolutely necessary to use fresh white wood, this will require more colouring than an older piece, but a rather strange thing in connection with this is that if some of the varnish has been removed from the parts adjacent to the freshly inserted wood, the old material will require colouring down as well as the new, but not so much. This seems like some indication that varnish does get lowered in tint as age progresses; it may be, however, that the top surface of the wood gets darker than the under parts from the action of light.

The final touching up or finish of the newly inserted wood and its varnishing will have to remain over for the present, and will be taken up after the mechanical work is concluded.

Having thus far got to work upon a fractured or lost piece that may have been knocked off a projecting part

of the scroll, there are other injuries likely to occur to this part of the instrument and caused in a variety of ways, some occasionally seeming mysterious in their origin. Thus from a weakness or flaw in the grain of the wood, or it may be from a blow having first started a crack and successive ones gradually increasing the fracture, the scroll itself will come away bodily, separating at the weakest part just behind the second turn. This is a delicate matter for manipulation. If the fracture is quite new, the raw surfaces uninjured and some properly prepared rather strong glue is handy, then an almost instant application of it to both surfaces and pressing them together, exactly fitting, will result in an effectual and lasting junction of the parts. But supposing the breakage to have occurred some time back and the parts to be separate and soiled, the difficulties are much increased, as in the majority of cases no purchase can be obtained whereby a good pressure can be directly applied. Cramps cannot be applied, therefore, with any degree of safety, even if a good grip can be obtained and with the safeguard of some padding, as the first is bound to injure the wood around, leaving an ugly imprint of the grip, and thus making things worse in appearance instead of better. The other is likely to be productive of slipping out of position, the hold not being retained, and vexatious results ensuing with the accompaniment occasionally of unprintable language coming from the repairer. The best way on all occasions will be found to be that in which patience is not taken as a virtue but as necessity, and the presence of Old Father Time altogether ignored, which may often mean time saved. Constant practice may give facility in keeping pace with that steady old party with the hourglass, but a good result is seldom obtained when the clock is much consulted during the progress of the work in hand. It is this which has caused the complete ruin of many a damaged gem from Cremona's workshops of the olden time. We will therefore suppose the repairer to be unfettered by time and that he will be properly paid for work that will tend

to restore the commercial value, as well as the usefulness and beauty.

The main consideration will be the manner of getting a proper attachment of parts that cannot be wedged or forced together at once, in fact, to get a good purchase or leverage. This must be either obtained indirectly or dispensed with altogether. For the former, building up or "making," as it is termed, must be resorted to, and which may include temporarily glueing fresh wood on to the old parts to be separated or cut away afterwards. Many inexperienced repairers are too apt to look upon all glueing as for permanency, but practice should soon make it plain that all joinings are effected only for such length of time as may be desirable. In making or building up a part from which we can obtain a stand or commanding point from which to get a more direct purchase, it may be necessary to glue one or more pieces of wood, cut to a proper shape and stuck with a dab of thick glue and left until dry. For this purpose the soft white wood or poplar referred to at the beginning will be found useful, it is so easily cut with a chisel or knife keen edged—this condition is an essential at all times. By the bye, some readers may be thinking of the best means of getting a nice clean edge to their knife or chisel. There are several kinds of oilstone or hone in repute for giving a finishing or sharp cutting edge, England, America and the European continent supplying them, the "Chalney Forest" being the commonest known in England; the American "Arkansas" or "Washita" are expensive when very good, but there is nothing that can beat a well selected piece of "Turkey stone" with a nice even surface to begin with. For obtaining a clean cutting edge, a few drops of oil before rubbing will be sufficient. Olive or good mineral oil will do, the latter preferably as it gradually evaporates; whereas vegetable oils acquire a siccative property from contact with the minute particles of steel; the stone then gets clogged and unworkable till thoroughly cleansed. Mineral oil disappearing gradually leaves but little residue, which can be now and

again wiped off. In cases where the utmost delicacy of surface cutting or close fitting is required, and where no other tool but the chisel can be used, it may be as well to have at hand a stout, smooth leather strap fixed at each end over a piece of wood about twelve inches in length. The residue on the Turkey stone can be taken off with a knife—care being taken that no dust or grit is with it—and smeared on the strap with a little olive oil. The chisel or knife used briskly and gently on this will after a few passes become as near perfection of keenness as possible. After getting everything in readiness, which will include the carving to shape, of any wood that is to act as a support or fulcrum, these parts must be made to fit as accurately as possible, and may not require glueing but at one or two places, and those selected to come in contact with those of the original structure least liable to be affected or damaged. Thus the interior of the peg-box will be found a convenient position from which to build a support that shall reach up underneath the volute or under turn of the scroll. Having well tried the parts as to the fitting, the support or prop may be secured or glued in roughly to the lower surface of the peg-box—presuming of course that the pegs have all been removed—and left to dry hard. When so the parts had better be tried for fitting again, and if any little inaccuracy shows itself, or the pressure in glueing the fracture is likely to be uneven and the junction be untrue, a little paper or card may be inserted or even glued in between, or where judgment may dictate, to enable a good distribution of the balance of pressure necessary. There can be no certain description given of the size or form of the supports or made up parts to be temporarily fixed; all must depend upon the estimation of what is best to be done under the circumstances; it can be likened to engineering on a minute scale, quite as interesting, but less dangerous, while more comfortably conducted in your own home without exposure to the baleful influence of unsympathetic elements.

The next and most necessary proceeding will be the

cleansing of the surfaces that are to be permanently joined. In most instances the application of clean cold water in a sponge will be sufficient, but where much grime and grease have accumulated different means must be resorted to. Soap is not to be recommended but, and especially if the surfaces are irregular, some pure benzine, applied or slightly scrubbed in by a stiff brush, not too large, and the parts then wiped repeatedly on a clean cotton or other absorbent rag. Pure benzine, if not rubbed in too hard or too long, will not injure the adjacent varnish, be it the delicate film on a thousand pound gem of Cremona or the flinty covering of a less presumptious output from Naples. When evaporation is complete, it will be so in a few minutes, some clean water brushed in and wiped away, will leave the surfaces in a state for receiving glue.

The glue should be of good strength—the junction being intended to be permanent—and applied in a warm atmosphere or the parts warmed a little, as, under different conditions the glue will coagulate or "set" (diagram 18). When the parts are placed properly in position, and the outside blocks or buffers adjusted for opposing pressure, the cramps may be applied and screwed fairly tight. If the surfaces meet well and the pressure is properly distributed, the glue will ooze out at the juncture of the fractured parts. This can be wiped off with a cloth, but occasionally mended parts cannot be got at easily, if so the glue must be rubbed away after cramps and moulds have been removed, by a damp sponge or cloth and then wiped dry. Sometimes differently to the above mentioned simple fracture, it may be of the kind described by surgeons as comminuted or split into small fragments. This will be found to be much more troublesome than the former; after cleansing as usual, if the injured parts are actually separated from the main structure, judgment must be exercised in selecting those portions—the largest if possible—that when glued in, will act as a support for others to be afterwards inserted. The same attention in kind and amount will

Diagram 18

Diagram 19

Diagram 20

DIAGRAMS 18 TO 20.

mostly bring about a satisfactory result, but frequently with this class of fracture minute pieces may have been lost past recovery, leaving a small gap here and there to be filled up somehow. These places, if large enough, should have pieces let in according to the manner before described. If they are too small for this treatment—a little experience will enable the eye to judge at a glance—then the only course will be to fill them up with some kind of paste or improvised mixture. For this purpose a good "stopping" must be made. This has, in olden times as well as the present, been a difficulty to meet. Many kinds of material have been used, most of them having some objectionable quality; some repairers keeping some kind, others generally making further experiments. Among the various materials plaster of Paris or common chalk worked up in glue has been frequently used; it is certainly strong for some time after use, but gradually, as age creeps on, contraction takes place towards the central portion, and a small fissure all round is seen more and more evident, and which gets filled with grime causing a very distinct black line, which draws attention to the spot, the substance also being so much harder than the surrounding wood, gets polished with a little friction and usage and declares its unsympathetic nature; further, it is difficult to colour successfully, or even well, and for these objections it should never be used. Wax is another material that has been extensively in use among the older English repairers, but it has very little to recommend it except handiness, and that quality ought not to be placed in the balance against much more important ones. It is not easily colourable; with usage the top surface gets wiped off, leaving a hollow. Powdered wood with shellac, or the latter with some heterogeneous materials have also failed, as the alcoholic solution destroys the surrounding varnish.

Sealing wax has also in turn been used with no better result. Other substances are met with whose precise nature is not known, odd mixtures made up in a hurry at the moment of requirement, but no material or mixture

has been found to excel that made with wood and glue. Many, perhaps the majority of instances in which this has been used, have also been failures; not from any inherent defect in the substance, but from lack of proper management. Different varieties of wood have been tried, a great drawback being the contraction when the glue dries; this is markedly the case when a hard wood, powdered by glass-paper, is used. The granulations and their hardness are also objectionable, and if ground up too small, contraction to a greater degree takes place, and the repairer's object is defeated. Long experience has shown that the disintegrated fibres of soft pine, not powdered, offer the best security against contraction, it can be made strong or weak according to the thickness of glue used, is always at hand, and on the whole gives the least trouble. It requires little or no colouring, and moreover approaches nearest in character—or can be made to do so—to the surrounding material. If there is a selection possible, the well known soft grained American pine should in preference be used. There is a good and a bad way of managing the process to ensue. To roughly seize a chump of wood and begin filing it away anyhow, collecting the residue and making a rough paste, will bring disappointment, as sure as houses built with wrongly mixed mortar. To put method into the matter, a piece of clear, knotless, soft, grained wood should be obtained and cut to a cylindrical form (diagram 19). A flat file of rather fine texture—this may be according to the size of the instrument to be repaired—should be worked against it at right angles. The file (not glass or sand-paper) must not be of the toothed kind, but grooved. The shower of particles sent off during the action of filing, will consist of a number of minute silky fibres, which, of course, must be collected together, placed upon a clean porcelain dish, or palette, and worked up with glue—strong—for filling spaces in the maple, and weaker, if used for the pine of the front table. It can be tucked into the crevices as required by the end of a small, worn, or pointed knife. Some portions will remain above the surface and, in fact, will not go in

completely, owing to the fibrous, or threadiness of the mass, but this constitution is the safeguard against its contraction, the glue in drying clinging round the fibres instead of to itself. When dry and hard the projecting portions can be neatly levelled off. If, as will sometimes happen, a little hole or two can be perceived, perhaps under magnifying power, the process can be repeated on a minute scale. By attention to the above there will be but small risk of contraction, and if cleanly done there will not be much trouble in colouring the part to match the surroundings.

We can now advance another step and notice a frequently occurring fracture that is caused by the constant pressure and tuning up of the A peg, at a part which in many violins, owing to the peculiarity of design, is a very weak one, the grain of the wood above the peg being short and liable to overstraining by impetuous performers. Being one of the most inconvenient positions on the instrument for working upon, if the repairing is not effected in a methodical manner, it is nearly certain to come undone again. The crack is more often than not unperceived for a considerable time by the performer, and meanwhile grease and dirt work their way secretly into the pores of the wood. A repairer may take a glance at the state of the fracture, whip out some glue, paint a little on each side, wriggle the whole well at the risk of extending the wound, get in a little more glue, and let that harden under pressure from the cramps, which—unless extraordinary care and skill is exercised, damage other portions of the work—replace the peg and send the instrument home again apparently as sound as new (diagram 20). This treatment, if resorted to immediately after a sudden and clean fracture, may be effectual for some time, but if, as above mentioned, it has begun secretly and enlarged by degrees, the kind of repairing described will serve but a few turns of the peg, when crack it goes once more. Off to the fiddle hospital again, where it may be possibly subjected to a repetition of the treatment, especially if the owner is of an economical turn of mind as regards "bill of costs."

Under the above circumstances of combined age and dirt, some repairers would dare to increase the fracture or pull the scroll quite off in order to get at the part, cleaning it well before glueing it on again. This is making things worse, particularly as this part of the violin is one of the most awkward at which to apply direct strong pressure on a good and neat junction.

Sometimes the first mode is resorted to with the addition of what is called bushing the peg-hole, that is, after the glueing performance has been gone through, it will last strong enough while the hole is being enlarged, a cylindrical plug of wood being inserted, and glued. This is levelled down and re-bored, to suit the peg or a fresh smaller one. This treatment is to be avoided if possible, as it is accompanied by a more or less disfigurement of the "cheeks" of the pegbox, and at the best is uncertain. A much more sure and neat method is, in the first place to clear all dirt and grease away possible, and gently work some clean water into the crack, repeatedly wiping with a clean cloth. When sufficiently done, some strong glue may be worked in, in like manner, cramps and pads applied and the parts brought neatly in contact.

When the glue is thoroughly hard and dry, on the inside of the peg box extending each side of the crack and beyond the peg hole, a space must be cut away having straight sharp sides to the depth of about $\frac{1}{16}$ of an inch, perhaps a trifle less. It must be done with keen edged chisels—size according to requirement—and the walls made as even as a piece of plate glass. Sometimes, in consequence of the shortness of the peg box, it will be necessary to make the cut away space extend further upward, and into the solid part. In all instances it will test the mechanical dexterity and patience for cutting in confined spaces. When this has been accomplished to satisfaction, a piece of maple without curl or knot must be cut a little thicker than what has been removed, but as to superficial area, fitting to a hair's breadth if skill will allow.

Some old scrolls, particularly among the old Italians, are made of beech or other tough woods; in these instances the material must be matched according to the means at the disposal of the repairer. In cutting the small veneer of wood to be placed in position, care should be taken that when fitted in, the grain should run as nearly as possible at right angles with that of the part to be repaired. If this is attended to, with all other necessary precautions, there will be little cause for fear of the part going bad again, in fact it should be actually stronger than before.

It may occasionally happen that both sides of the peg-box have been strained and split, with accompanying conditions of previous bad repairing and dirt. The same treatment will suggest itself for the "double event" as sportsmen say. But the two fractures are really as easily repaired—that is, with proper care and skill—as the single one. This is because the same cramps can be used for joining the two fractures simultaneously. For this operation the cut out space referred to close by, if not covering the peg-hole, will have to be repeated on the opposite side with great exactness, so as to allow of a single fitting up and filling the intermediate space, the grain running as described before, and which will therefore be—when placed in position—with the end of the grain towards the spectator—looking towards the front of the peg-box. It should be neatly and very closely fitted (diagram 21). In carving the blocks that are to be used outside the peg-box for evenly distributing the pressure, precautions must be taken not to cut them of equal thickness, or when the pressure is applied, they are likely to slip, particularly when the pegbox diminishes rapidly in width under the volute. They must therefore be cut more or less wedge like, according to the modelling or proportion of the parts, so that when placed on, the screwing of the cramp will be direct. When this is done to satisfaction, the usual process advised for the glueing may be proceeded with, and being carefully seen to be in proper order, the cramp with pads against the outside

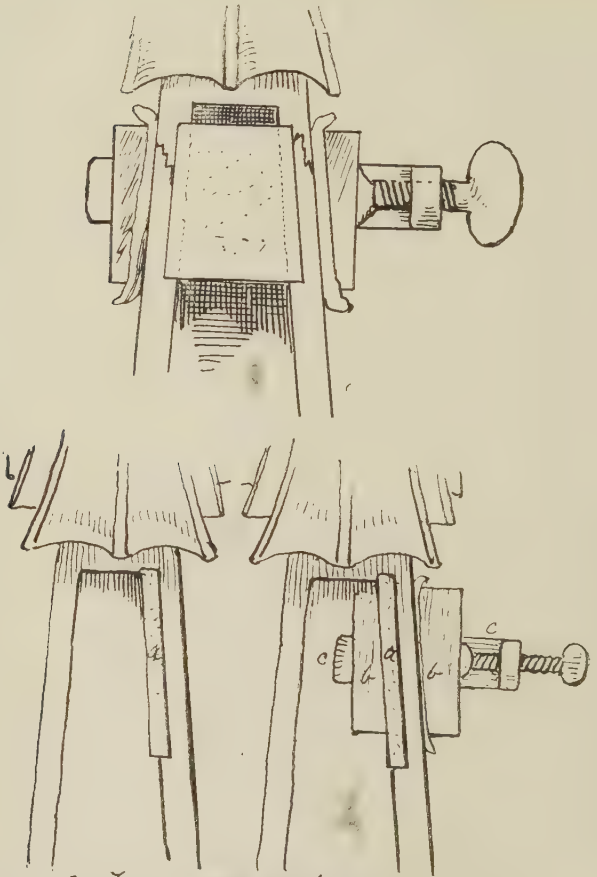


DIAGRAM 21.

cheeks of the peg-box may be screwed on rather tightly. When quite dry, the cramp being unscrewed, the side block of wood will be found firmly adhering, with the superfluous glue squeezed up from between the surfaces by the pressure.

The next proceeding will be to level down the projecting parts of the block in front, to the line of the throat. This being accomplished with great neatness—the line of old work and new wood being exactly level, a line may be drawn with a pencil or cut with the point of a knife over the block as a continuation of the inner surfaces of the peg-box. If carefully managed the knife point is preferable, a piece of stiff card or very thin veneer may be cut to the width, bent over and the point run down each side. The advantage of the knife line is that you have already a cut to work up to. After this the chiseling out or mortising can be proceeded with. The tool must be very keen edged, and as the cutting has in great part to be done against the grain, no violence must be exercised; rapidity will only come with regularity in taking off thin shavings. When all the surfaces have been carefully pared down until, as regards thickness and evenness of line and surface, the peg-box is just as it left the hands of the original maker, there will remain to be done the clearing of the wood at each of the peg-holes which will have been covered by the block perhaps wholly or more than half way. In the case of the double fracture this will be found to be in the same condition on both sides. The hole will require continuing through the fresh wood, in fact re-boring so far as this is concerned. It will be a more or less delicate operation to prevent splitting the wood, especially if from shaving down to the surrounding levels, it is not very stout.

To guard against catastrophy, a small hole should be bored exactly in the centre. Particular attention must be paid to this, or the whole work may be spoilt and a fresh block or bushing of the hole be found necessary, and much of your work to be done again. The small hole may be drilled if you have the necessary means at hand,

if not a small brad-awl may be used, not of the usual round kind, but square. Such brad-awls are, I believe, known as chairmender's brad-awls. If one cannot be obtained, an ordinary round one can, with a little trouble, be filed square. The advantage of this form of awl is that it does not split the wood and can be used with safety and certainty where one of the ordinary pattern would be certain to split and spoil the work. Several sizes may be used to enlarge the aperture, the square edges breaking away the sides without causing an extended crack in the direction of the grain. When sufficiently enlarged, recourse may be had to the rat-tailed or circular file. Here again much care must be taken, as the toothing of the file is arranged somewhat in the fashion of a screw, and if the tool is used one way it soon buries itself, becomes tightly wedged and will inevitably split the surrounding wood. It must therefore be turned in a direction that may be called backward, the revolutions to the left instead of to the right. It will take a little more time than might be expected, but the result will be more satisfactory, free from danger of splitting and the interior surface of the hole be made smooth. The use of one, a degree or two finer in tooth will give enough finish. A constant look out must be kept that the tool is working properly in the centre; should it be found working a little too much to one side, it must be removed and the opposite part gently cut away by a slender sharp knife so that the equality may be restored.

Caution must be exercised that the action of the tool is arrested at the right moment, that is, when the opening made in the fresh wood is worked closely up to that of the old; the tool should not be allowed to work against the walls of the old aperture, as there is much risk of damage or enlargement and the necessity of a fresh peg, which is to be avoided, if the set of pegs have been doing their duty well and are free from splits. In the fitting of the peg, a degree of tightness into the new wood will be found advantageous; the surface being fresh and softer than that of the old, soon accommodates itself during the

insertion and revolution of the peg, whereas the process will have been going on a long time with the old walls which have become hardened. After a few turns with the inserted peg, the fitting of it will have been tested, and if satisfactory, it may be taken out; a piece of soft chalk stroked down and followed by a piece of very dry old soap in the same manner at the parts coming into contact with the interior walls of the aperture and will stop any squeaking or catching. The proportion of soap to chalk must be varied, the one, soap, being increased according to the catching or jerking and lessened if there is too much slipping and no grip. It may be as well to note at the same time that the peg should be quite circular, or it will revolve by fits and starts notwithstanding soap and chalk, or any other mixture.

CHAPTER V.

FRACTURE OF PEG-BOX AND SHELL—CHIPS FROM THIS PART—FILLING UP OF SAME—RESTORATION TO ORIGINAL FORM, AFTER PARTS HAVE BEEN LOST—WORN PEG-HOLES, RE-FILLING OR BORING SAME.

WE may now take another degree lower down and study the treatment best for a fracture similar to that last described, but which, if at one of the lower peg-holes, may appear quite as difficult to manage, if not more so, as at the upper part, in consequence of the curved form of the shell or lowest part of the grooved back of the scroll. Firstly, the cleansing must be effected and drying, as previously with the upper fracture, bringing or pressing the parts together for testing their accuracy of fit. The cramp must be again brought into use. Owing to the wider and deeper hollowing of the back at this part and the longer and often very unequal continuation of the line of contour, the shell or tail end sometimes curling up more abruptly than usual, an increase in the substance of the padding against the cramp will be found necessary. A piece of cork cut or filed to the shape will prove handy and effective. The superficial area of the interior walls of this part of the peg-box being much greater, the thickness ditto, there is seldom a necessity for fitting a block of wood in the manner before mentioned, unless as sometimes it is found, the part has been so worm-eaten as to be too weak for its work of supporting the pegs and sustaining the strain of the strings. In that case, excision of the "honey-combed" part is obligatory and a slice of wood must be

let in as before explained. Sharp shaving with a minimum of force will be required. Should the worm-eaten portion extend to the outsides or "cheeks" of the peg-box, it would be well to insert here also another slice of fresh wood as before, the length according to requirement, but in these instances, the portion of the head piece under consideration being lower down and broader, the grain of the inside slice may run continuously with the original wood. It will also be inserted first, and not until the glue is quite hard will the arrangements for the outer one be commenced.

Especial care will be required in the management of the cramps—one or two may be necessary—as, if mere padding is placed between the iron and the wood, the latter, being in a state equivalent to rottenness, will be crushed together and the shape will be ruined. As a preservative against accident a piece of soft wood, perhaps a quarter of an inch in thickness, and cut in width and shape equal to that of the "cheek" of the peg-box, and placed over the part with a piece of paper against the varnished surface, will enable the rotten portion to keep its form, the pressure being distributed; care must be exercised in carving the block of wood that it reaches over and quite on to the sound parts. When the glue has hardened perfectly and the cramps have been removed, the careful shaving down and finishing of both the inner and outer blocks or slices may be proceeded with. If the burrowings and tortuous course of the obnoxious depredator give indication of its having been of huge proportions for its species, for these creatures vary in size from a small pin to nearly an eighth of an inch in diameter, and the tunnellings are not very close together, then pieces of fresh wood matched carefully and fitted in the manner before described, must be inserted and glued in. This will, if the wood is much riddled, be much like mosaic work, the fitting in of the pieces running here and there over the surface. The contour, however, is preserved by this treatment, it being difficult, unless the repairer has considerable artistic knowledge, to keep or

reproduce the exact form if the half or more of the peg-box and adjacent portions are cut clean away as is often done.

Scrolls of masterly design and execution are frequently met with mounted on a peg-box, selected or carved, without the least reference to the style of the original, imparting to the whole a hideously mixed and vulgar aspect. Save then, every morsel of the original work that you possibly can, especially if it be the work of old Italian makers, as it will be sure to have about it some points of interest, or that will call for your admiration of its artistic merits. Bear in mind that at the present day utility and low price are "to the front." Unfortunately for art, a very large section of the public called musical, ignore the artistic aspect of the violin, apart from its individual authorship and monetary equivalent, and think almost solely—not always in the right way—about its working or sounding capacity. To them one sort of curled heading to the peg-box is as good as another, if strong enough, the whole of this part of the mechanism being simply dedicated to the winding up of unwilling "catgut." The old masters. their pupils, and modern imitators, have thought otherwise and treated this portion of the structure as that in which they could concentrate much of their best artistic talent. To them it has been the crowning head piece of the work, and requiring for effect the closest attention in detail. Every part of it has received, by each master, a distinctive touch of tool, or conception of design, that the modern repairer should earnestly "read, mark, learn, and inwardly digest," so that if a small portion is by carelessness, or unavoidable accident, chipped off, the contour may not by restoration (?) be spoilt, or the flow of line ruinously disturbed. Some remarks might be made by some admirers of high finish in its simple sense, about the bold unfinished gouging of some of the old Italian makers, and queries whether the irregularities should be studiously followed up by the repairer, as it should unquestionably be with work of high refinement and minute finish. The answer is at once simple and conclusive, every part that can be

preserved should be so, and well studied, that the new work may be a continuation of the old to the minutest detail, even to the accidental emphasis of tooling left by the maker.

The fact must not be overlooked, that rough as some work looks at a glance, it has been, by masters of their art, properly thought out beforehand. Rapidity of execution, coupled with fine artistic style, is not to be acquired within a short space of time. In most of the apparently rough hewn scrolls of the Italian masters there is to be seen the result of experience in cutting, perhaps, hundreds of them previously. If we examine closely the mannerism of the different schools with regard to that seemingly insignificant termination of the back grooves called the shell; the different ways, breadths, depths and direction of the gouging will be found to give, not only an accurate indication of the country, or city, in which it was carved, but with it the school, or style to which the maker belonged, besides his own individuality. As a landmark for distinguishing these interesting particulars, every part of the scroll of an old master, with its belongings, no less than any other part of the instrument, should be treated by the repairer with much reverence for its age and respect for the talent expended on it in course of its construction. That this is not always acted up to I am reminded by an instance that came under my personal knowledge many years since.

A repairer and maker of some experience was examining a violin by one of the old Italian makers, that had, underneath the shell a rather sudden demarkation at the part where the graft had been fitted in. He remarked to the party who brought the violin, that if it were his own, or had been requested to put it in good order, he would file or glasspaper down the edge round the lower part of the shell, so as to make it conform with the modern work. The violin was not entrusted to his care, nor do I think many others were, judging by after events. Trust not any violin of value or interest to this class of repairer, or grief will count you for its own and mortification that of the fiddle.

Occasionally small pieces get chipped off the lower rim of the shell; the latter under these circumstances, as before observed, should never be rubbed smooth with glasspaper or cut down. It is not a difficult position to get at and small pieces can easily be inserted. This part also is so fashioned that a comparatively small loss of the edge, especially at the sides, will alter the whole character and reduce a most elegant and masterly form to that associated with mere rubbish. Three or four scrolls of Stradivari's are in my recollection as having been under such treatment and the contour being destroyed there was little about the general shape to remind the spectator of the beautiful design as it left the maker's hands. But, it may be remarked by a fortunate discoverer of an old gem, my Amati has lost all this part, cut away perhaps because of its being quite past recovery, and the question arises what had better be done under these circumstances? The answer, seek some party who has an Amati with this part perfect or in excellent preservation. Take some moderately firm veneer and after careful measurement cut pieces to fit as exactly as possible the parts answering to those of your own instrument that are missing. The line from the lowest part or edge of the shell and reaching right over the top of the scroll will require earnest attention and accurate fitting. For the next stage the pegs must be taken out as a matter of course. Number each one with a pencil for identification when reinserting; lay a piece of veneer flat on the outside of the peg-box reaching up a little past the top of the scroll; to do this nicely a segment should be cut away where the volute intervenes, and with the pencil, mark carefully on each side a line neatly against the back and front. With a sharp, narrow knife cut away the veneer up to the outside of the line, leaving, if cleanly done, an exact pattern of the throat or exterior of the peg-box (diagram 22). Next, as the veneer will not bend sufficiently, cut a piece of rather stout paper, and after laying it against the back of the scroll, a rough tracing can be made and cut to exactness by degrees, trying it against the model and correcting

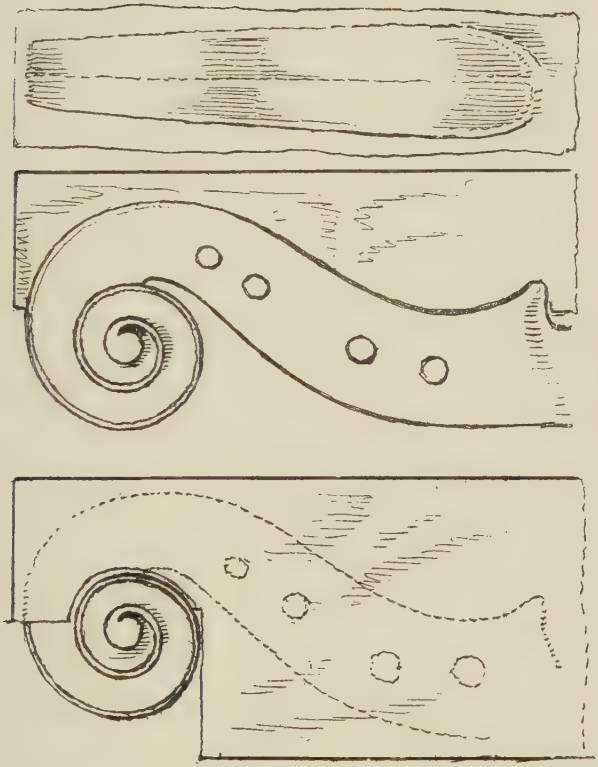


DIAGRAM 22.

until satisfactory. As this part of an Italian violin is not cut so mechanically as many people imagine, another and perhaps quicker way, if means are to hand, is to use thin paper and with some heelball, used by shoemakers, rub the edges that may be felt through and under the paper held in position against it. If the paper is kept from shifting a very good clear line can be obtained. The process may be adopted for the other parts instead of using the veneer, the latter would, however, be useful as a permanent guide or template, keeping its shape. This would not apply of course to tracing of the back part, which must of necessity be of a material that will bend or fold over.

Having procured a piece of sycamore, very old if possible, and with the closest resemblance in curl, texture and colour to the scroll to which it is to be attached ; it must be squared up and made equal so that the tracings of the two sides of the throat may be placed in position and transferred. This must be done so accurately that the new throat shall not be out of the square or twisted. More, of course, will be traced down than will be actually left, the reason will soon be perceptible. If the tracing is clear and well defined it will not require touching ; but if any part is not well brought up, it may be made sufficiently so by carefully running a pencilled line over the fainter one. The next step will be to get rid of the superfluous wood. This will be most readily done by a bow-saw after securing the block of wood in a vice, if these are not within reach, it can be done at a sawing mill where steam saws of different sizes and degrees of tooth are ready at a moment's notice and the removal of any sized masses of wood hard or soft is effected with remarkable precision and rapidity.

When the sawing is complete, the fining down, or smoothing of the sawn surfaces may be proceeded with. This may be done with a file, having one side curved, the other flat, and of rather fine tooth; a glass papering will then complete the process so far as the profile view is concerned. Further progress will be made when the

tracing of the back is transferred, the paper pattern being laid, or wrapped round, after being accurately adjusted.

The outside wood can be removed in the same manner as last described, with the finishing, or semi-polishing to the required degree. There will be thus cut out a replica in the solid or uncarved state of the whole of the part adjoining the scroll and downwards, which will be ready for the further process of joining on to the scroll itself. To this end, the surfaces that are to be glued together at the junction will have to be got into proper shape and condition, that is, both pieces must have flat faces, that when put together, will allow the line at the top of the scroll to run continuously and truly as if forming an original carved homogeneous work. The faces must be cut by a very sharp chisel, until fitting as nearly air-tight as possible. For highly finishing off these parts a small steel scraper should be used and turned round, working it in several directions. If the scraper is quite straight and sharp, it will with gentle handling bring the surfaces very flat, no movement or wriggling being perceptible when placed together, or there may be in very good work a slight kind of suction by the air being driven out from between them. The work will be then ready for glueing. The wood should be quite warm, the glue fresh and strong. A few seconds or so may be well spent in brushing or working the glue into the pores of the two surfaces to be opposed. If they are as perfect, or true as possible, a little rubbing together will be sufficient for an effectual and lasting junction without the use of cramps; but if there is any doubt on the subject, then the process described previously for joining the parts together after fracture had better be gone through.

When the whole is thoroughly dried and the glue which has exuded from between the opposing surfaces has been cut or chipped away, the gouging of the grooves down the back may be commenced, care being taken to follow the lines from the scroll downwards and gradually finishing backwards and forwards according to the grain. Different sized gouges will, of course, be required for this

work, according to the fashion or type of the violin. A glass papering of the parts will complete the matter so far as the exterior is concerned. Some restorers might recommend the glueing on of the scroll to be proceeded with earlier, or before the block has been finally reduced and cut to shape. There is not very much preference one way or the other; in the one above detailed we avoid the risk of fresh damage to the scroll while sawing and cutting, the rough or more violent tooling being done before the junction is effected. It would be as well to let the new wood be of full measurement to allow of fining down the new surface to meet that of the old, which may possibly have some lustrous varnish upon it, and which every good restorer would do his utmost to preserve. After this is all satisfactorily done, the lines may be traced which are to act as guides for the hollowing of the peg-box.

For this purpose a rather small chisel of the kind known among cabinet makers as a mortising chisel will be required. Gently and by degrees the mass of superfluous maple will have to be removed. It must be borne in mind that maple or other tough wood will not bear the forcing that a piece of pine will. A hard-wood workman is essentially a man of degrees, the tougher the wood the less must be shaved off at a stroke. The strong, massive form of the mortising chisel is used in order that there may be as little spring as possible in it while cutting and so prevent a hacking of the parts instead of a clean cut surface; indeed, no other proportioned tool can be used with any degree of facility. It must not be ground to a very acute angle, or the objections that are sought to be avoided will reappear in another form. Great care must be taken that the mortising does not extend to a depth that will cause the back to be thin and weak. This mistake is often seen to have been committed in very valuable instruments, especially such as have the two grooves deeply modelled, or the contour downwards from the volutes is much indented. At times, on the other hand, sound judgment has been perceptibly directed to this part and instead of cutting away wood to allow of

freedom in the winding of the strings over the pegs, the holes for these have been filled up and re-bored nearer to the front edges. Many most excellent old Italian makers seem to have been rather careless with regard to the exact position of the peg-holes, making them to be equi-distant from each other. There might have been little or no objection to this in the days when the strain on the pegs was not near what it is in the present times of very high pitch. The shaft of the old pegs used in Italy at the time of the great masters, was not half as thick as is thought expedient now. Towards the latter end of last century and the beginning of this, more attention was paid to the matter, and we accordingly find the two upper pegholes much closer together and the two lower ones ditto.

Concerning the refilling or "bushing" as it is termed of the peg-holes, a few words may not be out of place. For the purpose the holes must be enlarged more or less or there may not be sufficient of the new wood to hold together when the re-boring takes place. The cutting must be truly circular and very sharply done, no tearing of the wood must be perceptible, but a clean, almost polished surface inside. A solid cylinder must be cut with great exactitude, of maple or the same kind of wood if obtainable as the scroll. The old makers did not invariably use maple, perhaps being unable to obtain it in sufficient quantities for their business purposes. It is useless to think of cutting the cylinder or rod any other way than with the grain, it is seldom if ever done, and moreover involves an expenditure of time and labour that brings no adequate return. The enlargement of the hole must be effected by a good form of tool and this in good condition; peg-hole cutters and fluted rimers are sold for the purpose. When the cylindrical rod is cut and rounded to make an exact fit, a portion can be cut off a trifle longer than will be apparently necessary so as to allow of finishing off. If satisfactory in all respects, recourse may now be had as to the solution of glue, which should be quite fresh and strong, as this is to be for a permanency. The rod or portion should be warmed if the season is cold, the glue

allowed to settle round for a moment while some should be placed on the inner surfaces of the hole in which the cylinder is to form a solid fixture. When inserting the cylinder it should be worked round a little, but not jammed in with violence. Your reliance in repairing must not be in force but accurate fitting. The opposite hole to be used for the same peg must be made and treated in the same manner. Some repairers, for economy of time, would make a fresh enlargement right through the two opposite holes and push the rod through both and glueing same at one process, cutting it away from the interior of the peg-box when the glue has hardened, but this is risky work. One hole is sure to be larger than the other and the fitting scarcely likely to be accurate both sides.

When a sufficient time has elapsed for the glue to dry, a piece of hard, but not too thick, cardboard should have a hole made so as to allow of placing on the projecting part of the rod, which can be now sawn off close to the card. When this is completed and the card removed, a sharp flat chisel will then reduce it to the absolute level of the surrounding plain.

The next stage will be that of re-boring a fresh hole in a proper position. This must be carefully calculated, so that when complete the whole of the four strings will be independent of each other, the A string not being in friction with that of the G or the D not touching the E. If this is not attended to, much trouble will be given to the performer, the jerking or catching of the string during the winding up, not being caused by any difficulties with the fitting of the peg itself but by the string pressing on and being checked by the peg of another. The boring of the fresh hole and fitting of the peg is of course a similar operation to that just described, with the difference that the peg must be more conical, whereas the plugging must be as near equal in diameter as possible along the whole of its length. The preparation of the fresh peg to fit the new hole will be already evident as to its requirements. There is one detail to be noticed, however, that of boring the hole for the reception of the string. Of course the E

will not require so large an aperture as the D. The latter will require the largest aperture of the four. If this operation is not conducted in a methodical manner, with a proper knowledge of the best treatment according to the material used for the peg, splitting will ensue, which is trying to the temper. When a peg is once split it had better be thrown aside as useless, the strain on it being unsupported by the solidity of the material. No wooden peg that has been split in the operation of boring for the string should be retained. It being necessary to use wood of the hardest or toughest consistency, the splitting tendency is increased as the grain is closer. There is discussion as to the best material for pegs, and here in my opinion the old Italian makers were wise in choosing the cherry wood seemingly abundant enough at their command. It is not so hard and brittle as ebony. Another wood was used by them, a kind of dark walnut, straight in the grain, but a little firmer than the rose wood so fashionable at the present day, which has a waxy consistency but accommodates itself to the jamming by the impetuous amateur who will have his way.

CHAPTER VI.

LOOSENING OF JUNCTION OF GRAFT WITH PEG-BOX, AND REFIXING SAME — GRAFTING, DIFFERENT METHODS OF PERFORMING THIS—LENGTHENING THE NECK—OLD AND MODERN METHOD—RENEWAL OF SAME—INCLINATION OF NECK AND FINGER-BOARD WITH REGARD TO THE BRIDGE—HEIGHT OF LATTER, AND REASON FOR IT.

IN our progress downwards from the scroll and its adjoining parts, before quite leaving it we may refer to a disorder sometimes occurring when the neck is modern and grafted on to the old scroll. There are several ways, or fashions it may be termed, in which this is effected. The most usual method pursued in England and Germany is that of sawing the head off at a part below the end of the shell and then chiselling a level passage so far as a straight surface makes it necessary along the floor of the peg-box. The sides are treated in the same way but the width across diminishes as they proceed upward. The solid graft is shaped, inserted, and afterward hollowed, but of this more presently. Like all other parts of the instrument, the junction or insertion of the neck or graft sometimes gets loose, from bad fitting chiefly, bad glue or prolonged exposure to damp. When the sides or back part give warning that they are likely to part, they should be loosened still more or separated and a little clean water on a brush inserted in the cleft where discoverable, the parts being pressed and worked ogether until clean, for all cracked or loosened joints

will be found more or less dirty and greasy. Some strong glue can be then worked in, both sides pressed together by cramps and left to dry. The backing of a flat piece of soft wood with an interleaving of stout paper or, better still, millboard, must not be forgotten. If, as sometimes happens, the flooring of the pegbox threatens to part from the graft in contact, the same course of working out dirt and inserting good glue must be pursued. In pressing the back or shell of the scroll, this being of short and sometimes abrupt hollowing, the pressure on the substance of the wood direct would be dangerous to its form. The fibres of the wood at the edge are necessarily very short and brittle. A thick piece of cork should, therefore, be placed between the cramp and the hollow grooving or shell, a small block of moderately hard wood being placed inside the peg-box as an opposing pad or buffer, the cramp may then be screwed down fairly tight. The two operations, glueing and pressing the side parts and that in connection with the shell, must not be attempted simultaneously.

We may now, being on the part as it were, take up the subject of grafting and the different and best means of performing this somewhat exacting operation. Accurate calculation and sharp straight cutting are absolutely necessary for even moderate success in this undertaking. As before mentioned, there is more than one method of securing a neck to an old head. Each one carried out with the necessary skill and neatness can be made a lasting and highly finished piece of joinery. The mode adopted in England (see diagram 25) is the most ready and gives the least difficulty in a difficult undertaking. The solid end of the graft is chiselled or planed off to a slightly wedged form with a straight or square upper end which is measured to reach when inserted, nearly or just up to the lowest of the upper two peg-holes. Great care has to be taken in the cutting that the sides are equal, otherwise the scroll, when fitted, will look awry.

Another method has been known as the French, and when neatly done is one of the most sparing of the old

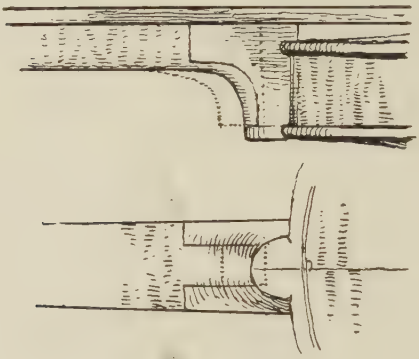


DIAGRAM 23.

Old method of lengthening neck, the dotted lines show it shifted forward and the part above the button cut away.

DIAGRAM 24.

Modern French method of grafting head.

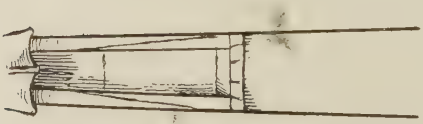


DIAGRAM 25.

Modern English method of grafting head.

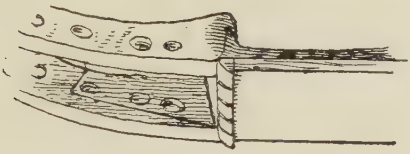


DIAGRAM 26.

Foreign secret method of grafting occasionally met with.

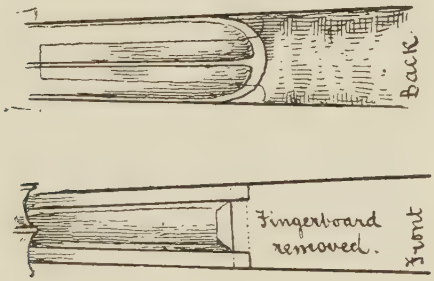


DIAGRAM 27.

Method occasionally met with, Italian.

wood (see diagram 24), but it is beaten in this respect by another foreign method (diagram 26), which is less evident to the eye, although requiring more skill in accurate cutting and adjustment. Another yet more secret I have only seen in an Italian grafting, and it may be native ; no join whatever is seen in a front view nor in the peg-box if this part is at all soiled or dusty, as is usually the case. This is owing to the join—there must be one of course—being each side at the angles formed by the walls of the peg-box. This is counterbalanced however by the necessary cutting away of the central line or ridge at the back for a considerable distance. If done accurately and

artistically, all very well, but this is not likely to be always the case, although a comparatively easy bit of work with the original lines each side as a guide. This method of grafting is puzzling when successful, as little or nothing is perceptible from the front and not much, unless searched for, at the back.

On measuring the different parts of an old violin in its original condition, we shall find the neck, taking from the edge of the upper shoulder of the instrument to a point where the nut is placed, to be not much more than four and a half inches, whereas our modern necks measured at the same parts would give five inches and an eighth. The old length taken at this part alone would give too short a fingerboard, causing the fingers to hamper each other, especially in the upper part of the register, where so many modern composers seek for effective passages. The neck must, therefore, to meet the requirements of the day, be lengthened. In the earlier part of the present century there was a method much in vogue for effecting this without interfering with the head and while keeping the greater part of the original neck (diagram 23). This was done by firstly removing the fingerboard, probably worn into ruts; the middle of the thickest or lowest part of the neck attached to the body had then to be loosened and removed, often no doubt a troublesome task owing to one, two and sometimes three nails being in the way, this in consequence of the habit of the old makers of attaching the neck with its scroll before closing up the body of the violin. Having accomplished this, the repairer chiselled off two square pieces, one on each side at the same end, and then fitted longer blocks with the grain running the same way. These were afterwards cut down to the proper form, so that the terminating part under the fingerboard increased the length of the neck to the modern standard. Of course, when fitted into the original space or socket from whence the neck was taken, the rounded part going to or above the button was now too large, this part was therefore cut, filed and finished down to the required size and shape.

This method of lengthening the neck, however, went out of fashion as connoisseurs and performers, finding the old necks so frequently devoid of figure—the reason being probably that plain wood answered best for the cutting of the volutes—made the repairers remove the whole of the neck and substitute one of the best figure they could obtain.

This forced fresh attention to the splicing as it is termed of the scroll to the neck or graft, and the method has continued to the present time of clearing away the whole of the neck and using handsome wood. Further impulse was given to the practice by the fact of the fingerboards put by the old makers rising so little above the body of the instrument. The bridge was made very low to accommodate this state of things. The increased rapidity of the movements of the bow from one string to another over the middle ones in the performance of modern music made a higher one absolutely imperative, as the heel of the bow would too frequently chip pieces from the waist curves. There were thus three good reasons at least for placing an entirely new neck on an old violin ; firstly the plain wood of the original maker, shortness and the low angle with regard to the plane of the body.

In order, therefore, that everything may be accomplished with sufficient exactitude, we will begin with the roughly sawn block ready for measuring and shaping up for its destined purpose. The scroll, which is to be replaced on a neck according with modern ideas, we will suppose to be on an Italian violin that has come down to us from the early part of the last century. The violin tuned up to the present concert pitch and music of our period having many of the modern style of difficulties, would prove utterly inadequate to the task of giving out its tones in a manner expected of it.

In proceeding to work then, the workman executing this modification having selected his block of curled maple, planes it to an oblong of equal breadth. He calculates as to the best position for showing off the curl on each side of the neck when finished. Having decided which is to be the upper part or that covered by the

fingerboard, this is planed to a good level and smoothed. A line drawn with a good pointed pencil or pointed knife, and sharply defined, is then drawn down the whole length exactly in the centre. At the end which is intended for the thickest to be inserted in the body of the instrument an equal width each side must be marked. Near the other end, at a distance that shall correspond with the opening of the peg-box, and equal width each side of the line must be marked off as at the other end. These two measurements will represent as nearly as possible the width of the neck along its course at the junction of the fingerboard. From the point representing the opening of the peg-box one of two lengths upwards must be decided upon; if the splicing is to be effected in the manner common in this country, a greater length will be required than for that of the French style. This latter is more to my fancy than the other, as there is less of the original wood lost. If for the former, a length of wood beyond the opening will be required of two inches, if for the latter or French a little over one inch and a half will be enough. The central line has of course been continued for the whole length of the wood. The waste wood at the end can now be sawn off down to the line. The next measurement will be, supposing the French style is adopted—that of the extreme width of the end, which will be given by taking a point at half the thickness of the peg-box wall at the part and similarly placed on the other or opposite and taking the width between the two. This divided equally and marked on the wood of the new graft each side of the central line will give the narrowest width of the part to be inserted in the peg-box. The outside may be then removed by the saw vertically. There will now be necessary the marking off a part on the graft that shall represent the thickness of the nut or the distance between the end of the fingerboard and the peg-box opening; the breadth across, or we may call it the length of the upper part of the nut, will be exactly that of and at the part where the opening will be made in the peg-box for the reception of the graft.

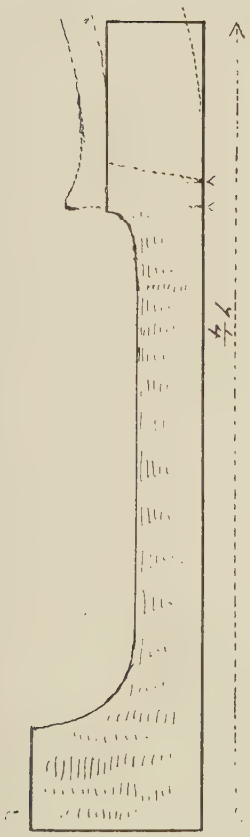


DIAGRAM 28.

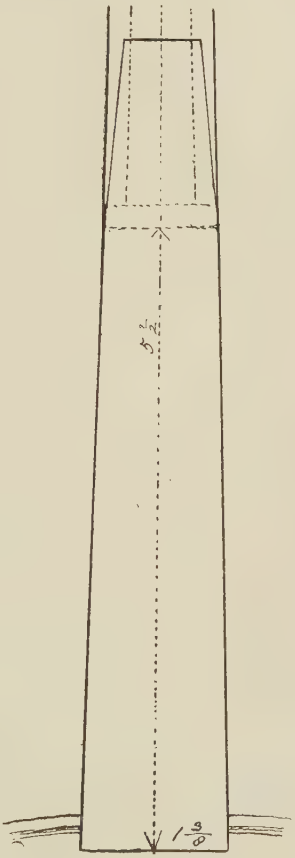


DIAGRAM 29.

The wood to be cleared away outside the lines which mark the width along the course of the fingerboard will be the next proceeding; it may be done neatly with a rather fine toothed saw and then carefully planed up closer to the lines, barely touching them. It is preferable to leave the sides for the present at right angles with the top surface, although they will not be kept so for long, but by thus working the measurements are facilitated. Going to the lower or wider end a line must be accurately marked quite square with the long central line, if not accurate the whole work will be thrown out of truth. On the sides there may now be marked and roughly sawn away (diagram 28) so much of the wood that shall leave

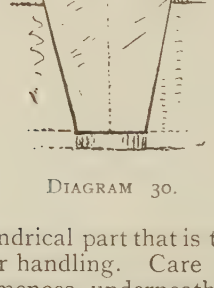


DIAGRAM 30.

enough for the cylindrical part that is to be finally rounded and finished off for handling. Care must be taken that the rounding commences underneath, a little away from the part that will be fitted into the peg-box. This of course must be according to measurement or template kept for the purpose if graftings are likely to be wanted in the future. There will now be required the marking of the exact form of the part that is to be inserted in the body of the violin, or more strictly speaking, into the upper block. This is done easily from a pattern cut to shape and size for instruments of average proportions. Sometimes, owing to the height of the ribs, the pattern cannot be applied so as to fit; in that case fresh lines

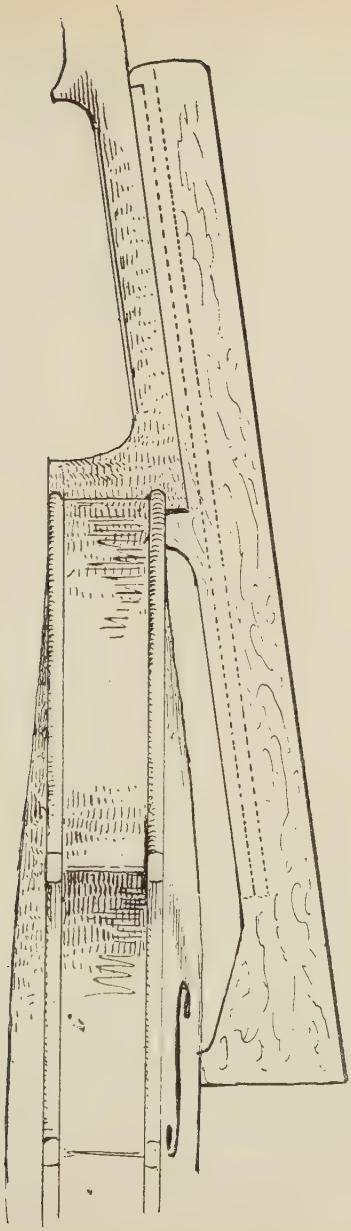


DIAGRAM 31.

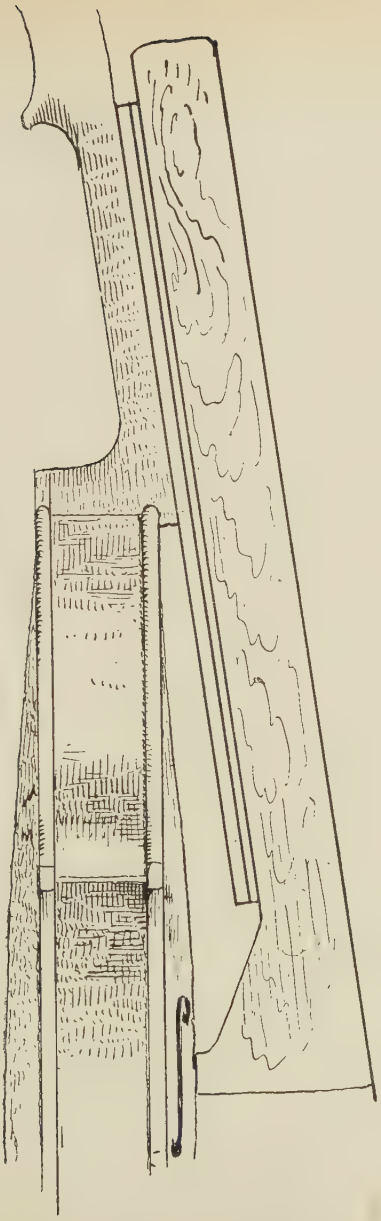


Diagram 32.

must be drawn to measurement as with the central one on the fingerboard plane.

The line dividing the part exactly in the middle must be accurately done, the distance at the narrowest or lowest part that is to be glued on to the button carefully marked, allowing the top part when placed in position to be a quarter of an inch above the border (diagram 29). The width of the lowest portion must be mainly guided by the size of the button, which, although there is an average of a rough kind, is sometimes small, at others very wide. The width must be taken of the button, carefully divided into two equal parts to be marked on each side of the central vertical line (diagram 30). All below what is necessary to keep may now be cut away, the surface being kept parallel with the fingerboard plane. The parts outside the slanting lines may be hewn away, the surface running evenly with the outer lines of the fingerboard width so far as it extends, which will not be more than about an inch.

The next process will be that of excavating the part that is to receive the root or end of the neck. If the instrument has been accurately constructed with the join running down precisely in the centre, the line already marked on the root of the neck will be a safe guide for marking each side of the join the width of the portion to be cut away. The depth inward of the cutting should be an average of a quarter of an inch. In case the already excavated part in an old and much repaired instrument is roughly torn about and made unequal in its measurements, attention must be fairly directed to this part separately; that is, if too much wood has been cut away on one side it must be replaced by fresh, after clearing away irregularities in order that a good fit may be accomplished. The fresh wood must be neatly inserted or placed in position and may be held in position during the hardening of the glue by supports or wedges placed across from side to side. When quite fit by reason of its dryness, the distance from the centre must be marked and the fresh wood cut away to the required depth and width with a

keen edged chisel and small shavings cut at a stroke, as there will be some cutting against the grain to be done besides working in a confined position.

Great regard must be paid during the process of cutting this part that the corners or angles are quite cleared out, or the neck when inserted as a trial or rehearsal will not give a truthful report of the accuracy of the incisions owing to some insignificant portions sticking up and causing the neck to look awry. So far we may take the fitting as having been accurately done to the central line down the middle of the instrument; but now comes a further process in connection with the adjustment of the neck, and that is, the rise and inclination of the level of the fingerboard in relation to the bridge which is to be fitted eventually.

The average—it may almost be called the standard—height of the violin bridge is one three-eighth inches. There are occasions when this measurement may be departed from, as in the instance of a high model, when an eighth, or even more, may be taken off with advantage. This must not be taken as necessary for the proper emission of the tone from a highly built instrument. The raising of the bridge in modern times is due to other causes, the most important being that of allowing better play or room for bowing rapidly over from side to side without rasping the border at the waist. It is an alteration which accompanied the lengthening of the neck and stop in the early part of the last century.

To obtain a proper setting or inclination of the neck, several ways are adopted by repairers. They vary according to the kind of guide or pattern used. This is usually cut from a piece of hard wood, sycamore or pear. It is sometimes made as a double guide in the adjustment of both the inclination and the elevation of the under part of the fingerboard above the body of the instrument at the junction of the neck. This we will call No. 1. The other, No. 2, is similar, but has the height of the bridge only as a fixture, the rise of the end of the neck above the border being higher and lower at discretion. Another

way, No. 3, is somewhat like No. 1, but would be used when the fingerboard is glued on before the setting. This should only be done by a fitter of some experience, as a little error in calculation is likely to lead to disaster. With each the application of the guide, or pattern, is the same, namely the testing of the exact coincidence of the inclination of the top surface of the bed under the fingerboard (diagram 31), or above the latter as shown in diagram 32. While getting the right inclination, in both instances it will be found necessary to ease the fitting of the neck into its socket, as the difference of the angle at which the neck is inserted causes an increase in the tightness of the contact of the parts. The lower part of the facing that is to be inserted in the socket, will have to be made to go into it at an angle comformable to that of the inclination or set of the neck. This will require executing with precision, and great care will have to be exercised that the squareness or rectangular disposition of the upper part already fitted and adjusted to the middle line down the instrument is not interfered with. It will be well to test this as the work proceeds. Some of the lower part, that coming into contact with the button, will have to come away in order that all parts may fit, and when fixed, form a homogeneous rigid part of the structure.

To ensure complete success in all the foregoing operations, every tool in use must be well sharpened, and all the guide lines accurately drawn. Part of the neck left rough and projecting beyond the button may be left for future manipulation, but the joints that are to receive glue—if done by a workman of skill and experience—will fit almost air tight. With regard to this, the parts likely to give the amateur most trouble will be the exact fitting of the flat opposing surfaces of the root or squared end of the neck or graft with the socket. It will be necessary to get a perfectly flat surface. In the first place, glass papering must be avoided, not from unsuitableness of material, for in that respect it is a temptation, but from the difficulty of regulating the pressure of the hand; with the exercise of the utmost care in handling the glass paper,

even when it is backed by a piece of hard wood, there will be found, when the test comes, a rotundity of surface that was deemed impossible under the circumstances. Careful scraping of the surfaces must be chiefly relied on for exactness. As good a mode of proceeding as any is as follows—after the first roughing into shape and then flat chiselling has been done to as great a nicety as possible, all the irregularities—there are sure to be some—can be worked down with the edge of a straight square file, used very steadily and crossways repeatedly. This done sufficiently and tested with some hard and truly cut substance, metal preferably, will be an exactly flat surface for working upon the final or finished surface. The next thing used will be a carefully sharpened and keen edged steel scraper. To put this tool into proper order for the purpose, it must be sharpened on a hone, not exactly at right angles, as the first impulse would suggest. The hone, or stone, must be quite flat and unworn. If done carefully, a nice level edge will be perceptible along its course, but it is not yet at its best. Placing it on a bed of hard wood, or evenly shaped mass of iron, projecting over and held firmly in position, a good stout brad-awl may be passed along from end to end, keeping the awl perfectly flat on the horizontal surface. The scraper may now be turned over and process repeated, but not in the same manner or angle, for the awl will be held vertically with the handle downwards and firmly pressed along the edge at right angles with the horizontal plane, this will cause a burr right along which will have a razor-like sharpness and cutting power. This scraper can now be applied (not too heavily) over the filed down surface, and thus work down finally all irregularities left by the file. The adaptation of this tool will at once be perceptible in the fine whitish soft shavings that will come off during its application. A little repetition across and across should give an almost perfect level. Different sized scrapers may be used for the other surfaces where it is desirable to obtain the most accurate fitting. If all the processes have been properly carried out, the parts

when tried by inserting the neck or graft for trial, should fit together without the slightest looseness or wriggling. They will now be ready for permanently glueing together.

It will be seen after perusing the above that the fitting of the neck or graft to an old violin, well or badly preserved, is a task not to be overcome easily and satisfactorily without much care and no little practical experience.

The whole of the work must be well looked over and tested as to the accurate fitting in all respects; nothing must be left uncertain or loose; in fact the flat surfaces for a perfectly successful result at the junction of all the parts should be as nearly as possible air-tight.

Having seen that the glue of good quality is strong and clean, the surfaces that are to come in contact may be brushed over with it. For this purpose a small hog-hair brush of about three-eights of an inch wide is handy. Where the grain or threads of the wood run parallel with the surface—this being less absorbent than the other parts,—there will be less painting over required, but where the grain comes end upwards to the surface the glue will be rapidly absorbed. The painting over these parts must be repeated, the glue as a matter of course being kept warm—all the work ditto, until absorption ceases. This is a matter of some importance, as in many instances joints have become loose or broken apart, not from the perishing of the glue or damp, but from the want of this precaution on the part of the repairer during this preliminary proceeding. It must be borne in mind that this is to be a permanent junction, not to come apart from any jarring or rough usage; it is also to be one of the most rigid, and only to be separated by a saw or chisel in the hands of some future repairer when it shall be absolutely necessary. Sufficient glue having been applied the work may be put aside.

It will now be apparent to those who have possibly done a little glueing that the whole of the wetted portions have to some degree swollen, and therefore if the junctions were brought together they would be found too tight and

refuse to meet. Just so; and that is one of the reasons for placing the work aside until the glue has dried at all the parts painted with it. When after a sufficient time has elapsed the work is examined, it will be found to have contracted to its old size and form. There will not be the necessity for waiting till the glue is at its hardest; probably time will not allow of this, some days being absolutely required, but it must, for the next process, be very firm and seemingly dried through.

Examination will reveal the fact of the whole of the surfaces that have been wetted, being raised or roughened under the foregoing operations. Recourse must now be had to our small scrapers again. These will again be applied carefully across and across the surfaces, until, in the judgment of the operator, the surfaces are level and clean. Particular care must be taken with the edges, angles and corners, that the superabundant glue is removed. The right angle of the scraper will be used for this purpose, and should a small particle or two, at any angle or corner, refuse to budge at the request of such a light tool as a scraper, the powers of a sharp chisel must be brought to bear upon the subject, and the obstacle removed. Close attention should be paid to the above, as in the operation of first glueing, the wood, or woods, having unequal absorbing powers, will swell in accordance therewith, and upset the calculations that have been so carefully made for the close junction of the parts. For first rate work, the scraping must be so carefully and accurately done down to the surface of the different parts, as to leave little or no glue above the surface of the wood. The desired result will thus be secured, that of the pores of the wood being closed or filled up. For the next stage the glue will not be necessarily quite so strong, a degree weaker will do. Everything must be ready to hand, including a cramp of sufficient size and strength. Before proceeding further, however, the manner of the application of the cramp must be considered. And now, how are we to obtain a direct pressure of the cramp on the largest surface, and

which would have to be in one direction, end to end of the violin, seemingly a perfectly impracticable matter? The answer is, it is not practicable, hence the above numerous injunctions as to preliminaries, and which have to do with counterbalancing the impossibility of direct and strong pressure. The only pressure that can be applied directly is that of a nearly perpendicular one, the cramp grasping the button from underneath, with a proper guard or padding of millboard, or cork, cut into shape.

A full brush of glue will now be passed over the whole of the surface of the socket, or receptacle for the root of the neck; which latter must an instant after be treated in the same manner. The two must be treated as one operation, and in a warm atmosphere. In the summer time no extra precautions will be necessary; but in cool weather the strong glue will soon set if the parts to be operated on are not kept in close proximity to a heating stove, or fireplace, or the apartment kept at summer heat. The neck and socket being thus kept at a warm temperature, the former will be firmly thrust into position, and with hand pressure put as close as possible. The superfluous glue will ooze out all around at the junction of the different parts; it it does not, that will be a sign that there is a looseness somewhere, or the surfaces have not been forced together close enough. This must be seen to at once, the parts separated and examined. It may be that the failure has happened through carelessness in allowing a chip to get in, or a piece of grit has prevented the opposing surfaces coming together. This being removed by a small knife, the brush, with a little more fresh glue, may be passed over the surfaces again, and the fitting this time should be perfect. The cramp and padding should be at once placed in position and screwed down tightly. All glue appearing above the joints should be carefully wiped away with a cloth kept ready to hand for the purpose; it is better to do that now than have to scrape or cut it away when hard; it will also save time.

Ample time must be allowed for the glueing to thoroughly dry. This must be estimated according to the conditions of the time and place. In very warm weather, or where the atmosphere is heated artificially, the time consumed in the drying and hardening is less than when the air is saturated with moisture.

When on examination the dryness is such as will warrant the removal of the cramp, this can be done. If all the measurements, fitting and precautions have been duly attended to, the neck or graft, with its line in the centre—supposing the present method is that adopted before the fingerboard is placed in position—will form an exact continuation of a line down the centre of the violin. A look down from end to end, or placing a long straight edged rule against the line, will be a way of testing this: if all is correct, the line will be perfectly straight and not bent. Should the latter be the case, the measurements, or fitting, in some respects, will have been inaccurate. It would be very provoking to find it so after all the trouble undertaken, and many instances are to be seen where the work has been left in this condition, and the stringing up and regulation has been, not only under great disadvantages, but absence of comfort in playing, and indeed the proper emission of the tone has been sacrificed. If the violin is one that is worthy of being performed upon with skill, there is only one alternative to putting it aside as useless, that of having the neck sawn off and the whole process of renewal gone through, with the aim of next time being more careful and true.

Supposing, however, the neck is truly set and all is satisfactory, the next stage will be the laying of the fingerboard. This should be of good, close and straight grained ebony, free from knots. Fingerboards are usually sold in the rough; that is, with the upper surface, or rounded part trimmed down to an approximate curve. They are cut to lengths of about ten inches and a half to three quarters. Should the violin require a fingerboard less in length than this, a small portion must be sawn off, preferably from the small end. Great care must be

exercised that it is done in right angles with a central line drawn from end to end. As the drawing of this line would entail some trouble, the under, or flat surface can be placed face to face with one that is known to be quite true, and a line with a fine pointed pencil made, or better, a scratch with the point of a small knife, guided by the true end of the perfect one. A fine toothed and sharp saw will remove the unnecessary wood. In doing so, precautions must be taken against splintering and spoiling the wood. To prevent this, a piece of waste wood, cut slightly out of the square, should be placed against the stop of the bench, so that when the ebony is placed against it, the sawing can be done flush with the side of the bench. The saw should be fine, in good condition, and gently used, or the line made will be ragged, ebony being brittle and splintering stuff, requiring some humoring in this respect. If the sawing is accomplished neatly and vertically true—this last is very essential—there will be little to do in trimming the surface of the end that is to come against the nut when near completion. A piece of fine glasspaper wrapped round a squared piece of pine, will make a good surface. The reduction of the width of the fingerboard at each end will then be proceeded with. In the case of an old neck being retained, the width of it at each end can be taken by compasses and marked on the flat side of the ebony. A thin shaving should be allowed for in finishing off. But we are on the work of a new neck; therefore the marking off should be done to some general standard. A good one may be reckoned as follows, for a violin of fourteen inches long and average width—total length of fingerboard, exclusive of nut, ten and a half inches—greatest width, one inch and five-eighths, width at nut, one-sixteenth under an inch. The ebony will be planed neatly down, with vertical sides, to these measurements. The height, or rise of the sides of the fingerboard above the maple, three-sixteenths of an inch, which may be kept for the whole length. The reducing to the requisite width and depth should be done with the plane

in good order, a metal one for this kind of work being the best. The surfaces that are to be glued together must now be considered. An untidy looking black line along the neck at the junction of the ebony and maple goes far to spoil the general effect; a glance at this part will at once be sufficient for declaring whether the neck and fingerboard has been fitted by a neat and competent repairer. A frequent cause of the dark line—it is really a want of proper fitting together of the parts—is the hastily planing the two surfaces—straight enough possibly—and delay while the glueing operation is in progress. The fact of ebony being almost equally affected by moisture as other woods—in fact, more so than some—must not be lost sight of. Coupled with this curling of the wood under the influence of damp is the want of proper regulation of the pressure after glueing and placing the parts in opposition. An old-fashioned method of uniting these parts is still pursued by some repairers—the surfaces are planed evenly, the glue is applied over them, they are clapped together and string tied tightly as possible. Diagram 7 will show a modern and improved method, that of a mould of soft wood for back and front of neck and fingerboard. In affixing the fingerboard many repairers have left a gouged channel reaching from the nut to the end or insertion of the neck. This may be seen sometimes on turning the part towards the light. The intention seems to be from an economical view, that of removing the ebony, if necessary, without injuring the glued surfaces by pouring a little water down the passage and waiting till the damp enables the fingerboard to be pulled off without fracture. This tedious operation is wholly unnecessary, for the time spent would be worth more than a new one with its trimming up. Some repairers have used a toothed plane on the level surfaces to enable the glue to grip well. This is another mistaken idea. The fingerboard should not be treated as a permanent part of the structure never to come undone, it should be so secured as to last as long as required under fair usage, but in case of violence it is best that it should snap clear

from the neck than hold tight enough to distribute, or concentrate, the strain on other and more delicate parts of the structure. Experience has suggested the following as generally best for all practicable purposes. The surfaces having been made true under the plane—this should be tested before the parts are glued, when, if true, there will be no line or the very faintest one seen. Along the middle of the ebony a very shallow gouged channel may be made, about half-an-inch wide and just deep enough to prevent the glue from touching when the fingerboard is placed in position. The level across over this channel from side to side can be tested by a metal straight edge or truly trimmed scraper. Occasionally from damp or the action of the plane the surfaces of both maple and ebony become slightly arched; in reducing this the scraper may be used with good effect, and a smaller one to take the least shaving more off near the channel, the even pressure when applied will close the outer edges more effectually.

The glue to be used under present circumstances should not be strong, and if the atmospheric temperature is below sixty, or perhaps not down to that, the surfaces of fingerboard and neck should be warmed. When all is ready, see that the ebony is placed evenly in the centre and then proceed to apply the cramps in the manner before described (diagrams 33 and 34). The one placed over the button and the arch of the fingerboard in opposition to it must be sufficiently large, and the hollowed soft wood mould, or pad, should be more highly arched than the fingerboard, so that when pressed down, the outer edges, and not the centre of the latter, should receive the greatest pressure. The other cramps having been screwed down under the same conditions, the work can be placed aside to dry and harden. When a reasonable time has elapsed, according to atmospheric conditions, as in cold, damp weather, more time should be allowed, but under all circumstances the most dry and sufficiently warm locality should be chosen; the cramps may be removed, and of course the moulds too.

We must now see to the working down of the graft or neck, not only to the requisite dimensions, but for the finish with some effort at style. By this last is meant such attention to evenness of contour from the button along to the edging of the shell, as shall be strong enough without looking heavy or clumsy; much of the nice appearance of this portion of the work depends upon the

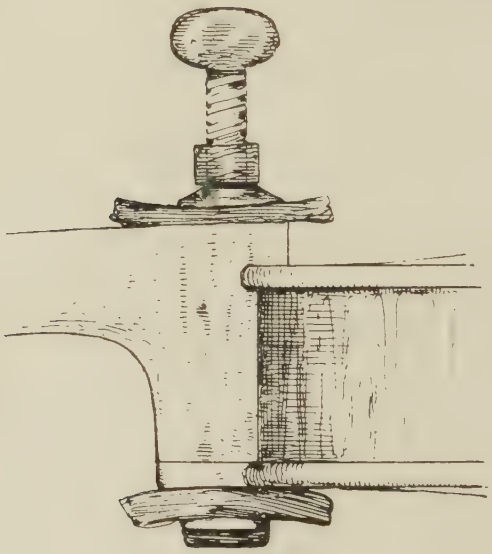


Diagram 33.

neatness of the workman. Assuming the button to be of the normal standard, or we may say, well calculated with regard to size for good effect—a good average width of this at the base where the curved line springs from the border is thirteen-sixteenths, and the projection forward—as it is not a geometrical curve—a half an inch. Some of the old Italian makers left the button very large, others small. The latter never pleases the eye of the connoisseur,

who, accustomed to the proportion given it by the best masters (also the modern makers), thinks it looks poor and incomplete. As the neck or graft has hitherto been left but roughly hewn out, it will be projecting for some little distance beyond that which would be occupied by

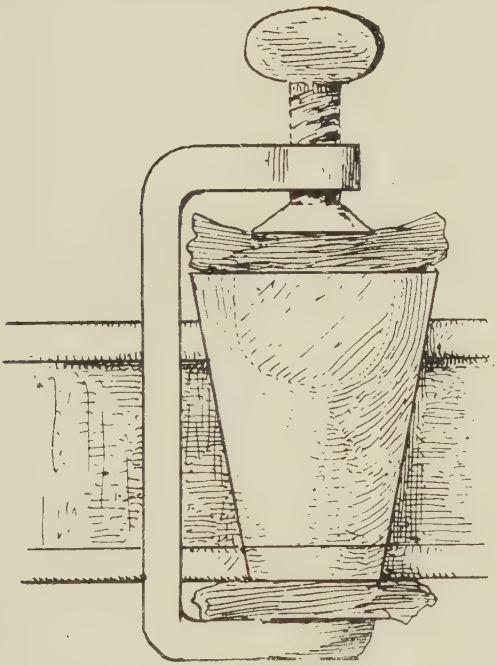


DIAGRAM 34.

any button of average dimensions. Supposing the button to be too small, or injured, and an addition necessary, for the next move we shall require a pair of compasses; with these, after finding a centre of the segment of a circle formed by the outer edge of the button, with the other point

find the distance inward, or the proper segment that is to be retained, bearing in mind that every possible part of the original button should be preserved; putting the point of the compass on the central spot as lightly as circumstances will allow, a thin scratched line must be made with the other point. Here we may remark that screw compasses should be used, so that distance apart of the feet may be kept rigid, as the width and the same circular scratch marked on the button must now be marked on a piece of maple, or, as is sometimes done, on ebony. The grain of either should run in the same direction as that of the button, or if done aslant it will look ugly when worn a little. The materials being matched, the fresh piece should be reduced in thickness to very little over that required for the height of the edging for the button; it should be a small cake of wood large enough to cover and leave a margin where it is to be fitted.

The wood of the button outside of the scratched line will now be cut away down to the raw wood of the new graft; it must be done with small and sharp chisels, carefully paring it down, leaving the edge up to the scratched line quite perpendicular and smooth all round: the strictest attention to this is necessary, so that the fitting on of the fresh edging may be done with exactness. We now take up the little cake of ebony, or maple, as selected, with the scratched line, which should be made from a central point close to the edge as possible: if this is a difficulty, the centre may be taken further in, the circular line also and the superfluous wood cut away to the central point, but not in a way to interfere with the equipoise when the edging is placed on for fitting; if this is not seen to the edging will, when finished, look awry. The middle within the scratched line may now be first gouged away and the wood cut with a sharp knife close up to and at exact right angles with the plane. A rounded file may with care be used to make a more even surface or run. If all this is done with precision, the parts may be tried together for testing—the glueing may be seen to and the

cramping done, with care that the fresh portion does not slip during the process out of its place. Some repairers would be tempted to rely upon the exact fitting, and simply slide the parts together, squeezing them well, but this is always risky. The work may now be put aside to dry.

The next proceeding will be that of working down or levelling both the ebony fingerboard and the graft, or neck. The first, in the state usually sold, will have an apparently well-finished off arching that may sometimes be near enough for letting alone after a little polishing down, but as a general rule it is not so, and further, if having been long "in stock," it may have settled down a little out of the straight during the seasoning process. Recourse should be had to the plane, a rather small metal one in good order with a keen edged iron. This must be closely regulated, or the surface worked upon will not be even but torn; hard woods, as before observed, require humouring and working down gently. The exact arching —in good work—of the ebony should be governed by a cut mould, one for each end. These may be made of some hard wood or metal, such as zinc, and if truly made will last any length of time. They should be trimmed to fit some fingerboard that has been ascertained to be just the thing in its arching. It may be as well to observe that some violinists prefer using a rather flatter fingerboard than others, but the medium is without doubt the best, and is not difficult to arrive at. The plane must be gently worked along from end to end of the fingerboard with as little pressure as possible,—hence the careful regulation and sharpness,—or you will find after a short time that instead of a nice even line, which must be tested from time to time by a straight edged rule, there will be a curved one, and this will necessitate further working down to the danger of losing thickness and sufficient strength in the ebony. If attention is paid to this, and a satisfactory even run of surface is obtained, glass-paper on a piece of straight, soft wood, but not of the finest degree, will be suitable for the present.

We now return to the modelling of the neck from the lower part of the back of the scroll down to the button. This last, with its fresh edging or shield, will require another scratched line, making two semi-circular ones; it must be done from the same centre and calculated to allow of the wood being hewed away outside, leaving the full measurement when finished off.

A chisel will now be brought into requisition for removing the useless wood outside the line last marked. The cushion or sandbag must be brought into use, the violin put face downwards, the fingerboard resting in a hollow. The neck or most convenient part for holding the whole with firmness must be held tightly, the chisel then worked downwards from the button, but not too far so as to cut into the portion that is to gradually enlarge, or form the quarter of a circle or the thickest part of the neck.

We shall now use a strong coarse wood file and turn the instrument round and about, work away the neck until just outside of what will be left when the polishing down takes place.

The curves should all be balanced well even while in the rough and the contour viewed from all points should be regular. The other end of the graft will require the same kind of attention, care being taken that too much wood is not removed. The level from each end must be seen to, leaving just sufficient wood to allow for fining down; the proportions must be well calculated, thus the upper end under the nut will be hewn down thinner than the part approaching the button, the line from each end being made quite even and the curving of the semi-circular shaft gradually tapering upwards. The glass-paper file before referred to will now come into service; it should be made of a nicely-squared plate of wood about six inches in length by about two and a half inches in width, with about one third of an inch in depth. We may call one side the front, the other the back; the edges of the former should be rounded down to a semicircular form. All we have to do in making this useful file

complete is to lap a piece of glasspaper of the degree of grain required round it, nearly meeting at what may be called the back for the time being. The surface with the rounded edging, or, as we have called it, the front, covered with rather strong grained paper, will be worked to make an even course all along the shaft, guarding all the while against working too much at one spot. The paper file may, after a sufficient working along the surface, be exchanged for one or two degrees finer, rubbing it in the same manner. For good mathematically even work, the graft should be turned round frequently, so that the light may throw up any little inaccuracies that may occur and which require individual attention. Here it may be remarked that if possible all repairing would be best done in an apartment that has as little reflected light as possible. The reason for this will soon be apparent when the fining down or polishing stage is commenced. One window, and that not too large, will be found advantageous. Little irregularities, however trifling, are best seen under such a light. Much rough work may very possibly be the consequence of badly-arranged light rather than inability or indifference of the workman. Repairs executed under unfavourable circumstances as above will often look very well until turned about in fresh and different lights, as they are sure to be, and then the faultiness becomes a surprise to the executant.

The glasspaper filing must be continued for some time and with several finer degrees until the surface appears perfectly even and seemingly quite finished, but the stages are not yet complete.

CHAPTER VII.

FINISHING THE FINGERBOARD—FIXING THE NUT—SIZE AND POSITION OF GROOVES FOR THE STRINGS—FILING DOWN THE GRAFT—SMOOTHING, COLOURING, AND VARNISHING SAME.

WE now turn our attention to the finish of the fingerboard, which must have its sides attended to for appearing in good trim. For making a nicely worked surface each side, some preparations will have to be made. Firstly, the nut having been cut to the width, or nearly so, of the narrowest end of the fingerboard and glued into position, it will have to be filed down to the height at which it is to remain above the end. The arching will have to be higher in the centre than at each side, in order that when the strings are drawn over tightly, the thickest, or D string, shall have more room to swing than the thinnest, or E. The arching will thus be unequal, the lowest part being at E, next a rise sufficiently for the A, then a further rise for the D, and afterwards a drop again to a little higher than the A; this will be enough for the swing of the G. The grooves for each of these strings must follow in the same order. They will not be equi-distant in one sense, as that would cause them to appear unequal when the strain is on them.

Probably the best way of securing a uniform appearance and the easiest, after one good result, is to cut a metal template with a spike at the central point or middle of where the string is to rest. These points will be

found unequal when pricked on to the surface of the nut. A very small, round file should now be used carefully with the run of the fingerboard, or the strings when wound up will look as if pulled aside out of the straight line. The file must be placed exactly on the spot that has been pricked and worked backward and forward as indicated. The ruts must be examined frequently for ascertaining whether they are sufficiently deep. The height of each rut above the fingerboard cannot well be given in fractions of an inch, as they must be regulated to the convenience of the performer. A hard, rasping, orchestral player, with a heavy, unsympathetic bow arm, will require the ruts higher above the board than a soloist of refined taste. The relative heights, one with another, must be the same in both cases. When the ruts are finished, recourse must be had to the glasspaper file again to round the top surface of the nut with an inclination downwards toward the peg-box. This is an arrangement requiring care, as, when the nut is level with the fingerboard, there is danger of the strings jarring. When finished sufficiently even the ruts may require a little further attention, as it is difficult to at once complete them. The two parts are perhaps best worked one with another, neither being finished off in one working and left.

We may now proceed to the further progress of the sides of the fingerboard; this, of course, can only be done when all is settled about the nut, this part requiring to be a continuation, notwithstanding the rise upward of the line from end to end. Preparation must be made for guarding the upper table of the violin from injury, from slips of the glasspaper file during the backward and forward movement. A good way to prevent this is to make a millboard or thick brown paper shield with a part cut away to allow the neck to have a hold. By putting this over the upper table and underneath the fingerboard a part will project forward on each side of the neck; it must be held in position by one hand, while the other holds the paper file, which will be worked along the sides of the fingerboard, at the same time being held nearly vertical.

After some little time the part where the ebony joins the graft will appear worked down quite smooth, some finer degrees of the paper will reduce the surface to almost a polish. The nut receiving a part of the working will now present an appearance—as regards form only—of having been left from a reduction of the fingerboard stopping short at a straight line.

This part now, if the fitting of the fingerboard to the graft has been neatly done, will show no line of glue or joint, but simply the difference of material. The upper edges of the ebony may be rounded down along to the end, but less at the lowest.

The whole affair, however, is not yet complete, as the surface to be varnished must be made ready for it. If left in the present condition, players who are very fastidious would be complaining of the work not standing well or deteriorating under use. The cause of this deterioration will be that the moisture from the hand in using this part of the instrument in the raw state makes the grain swell as if wetted; this would occur to some extent even if fully varnished. This must therefore be anticipated by passing a soft, fully haired and wetted brush, or damp sponge, over the whole of the new work. When dry the whole surface will appear rough, or if of soft texture, somewhat corrugated; this must again be levelled down with some of the finest glasspaper, great care being taken that all the parts, and angles especially, are worked over. If the corners are not equally attended to with the rest —and to do this properly the angle of the steel scraper may be used with good effect—there will be a roughness at the part over which the varnish will settle, become rough when dry, and give the appearance of untidy corners. If the scraper with right angles is insufficient to clear the corner satisfactorily, one with a rather acute angle will be found to do the work; it must be sharp, and gently used (or ridges small, large, or both, will become evident), working across first one way then the other until the appearance is quite up to the exactions and desire of the eye.

Another wetting will be of some further benefit for a good and lasting surface. When dry the roughness will not be so obtrusive as in the first instance, and the application of the finest grain of glasspaper, or a piece that has been under use for some time and got a little stale will give the desired surface. The action of the glasspaper over the surface should be continued for some time, until there being less and less powder routed up the surface, it assumes a polished appearance, and if the whole work is well done it will suggest a kind of finish that looks too good to spoil by covering up with varnish. But the latter is a necessity; if not really varnish in the usual sense of the term, a substitute must be used, and here we touch a little upon the confines of fashion or individual fancy.

It may not be generally known that the old Italian makers—I mention these as they have always been looked up to as guides for almost everything in connection with violin facture—varnished the whole of the neck—which under present circumstances we call the graft—with the same varnish and thickness of it as the rest of the instrument. We never see such a thing now, and if a maker were to send forth his new violins in this manner or trim, he would be looked upon as eccentric. Nevertheless at one time it was universal. Probably the increased number of movements of the hand, and especially the thumb, to meet the requirements of more florid execution and in connection with the growth of the ability among players for performing much music on the higher positions or shifts, showed very soon how the coloured varnish looked patchy under wear. This fashion of covering over the most handled part of the instrument with the coloured varnish then became discarded.

"Appearances must be preserved" was found to be an axiom almost forced upon the makers and repairers, and, as time went on, the substitution of strongly curled wood for necks or grafts, in place of the plainer material hitherto used, gradually settled down into the present fashion. Now-a-days the skill of the repairer is exercised

in the various treatment of this part. Players vary in their tastes or whims, some liking a perfectly smooth or polished surface as more suitable to their handling than what they understand as an unvarnished neck, others like it the other way as not so likely to slip, there being a little more hold or resistance. Anyhow, the raw wood cannot be left simply glass-papered, this would be speedily followed in use by an accumulation of dirt and grease unpleasant to the eye, and to the touch, clammy and unwholesome. It will therefore be as well to consider the two modes of treatment. In either case the parts of the graft near the insertion in the socket and at the other end where the pegbox is fitted will require varnishing down.

Before active operations commence a fair examination should be made of the colour or complexion of the body of the violin. Very often this has no attention paid to it, with the result of a hideous contrast between the neck and the ribs adjoining, a sign of bad workmanship and carelessness. The materials at hand for making a good match must then be thought over, the most appropriate selected and the number of coats, if possible, determined upon. This latter will be taken in a general sense, as an exact number will not be possible; appearances are in this process deceptive and must be regulated by the exigencies of the moment, but what can be calculated is the question of one or two applications only (which would result in a cheap and common appearance) or a number with the same materials carefully laid to the satisfaction of the repairer.

Without plunging into the whirlpool of the best or particular gums, resins and their individual mode of application, a matter that will take up hereafter our more undivided attention, it may be taken as a certainty that the varnishing materials used for the parts under consideration must be of an alcoholic solution, no other would "set," evaporate or dry with sufficient rapidity to allow of handling: or, as we may put it in another way, that would lose tackiness within a convenient time.

Most people are aware of the nature of an oil varnish

during the drying process, there is firstly the "setting," that is, all the volatile particles dispersing; secondly, the real drying or hardening which ensues with sufficient time or age; both accompanied with some degree of contraction, and until the process is complete, handling or friction of any kind has to be carefully avoided. This will at once show its unsuitableness for repairs and restorations, especially of the kind now under consideration. The same process has to be gone through in the drying of a spiritous or alcoholic varnish, but it is so much the more rapid in consequence of there being only the alcohol to disperse, leaving the resin in a comparatively dry state.

Colouring will be the chief consideration after the resin has been selected, and on this the judgment of the operator will have to be centred. For obtaining the effect desired or that is fashionable at the present day, one or two coats or paintings will be commenced at the corners where the graft is inserted in the upper ribs and gradually being thinned off as the curved part rounding upwards from the button dies away. Sometimes in consequence of the fresh wood appearing very white—it is not always possible to obtain aged wood—some colouring material or stain mixed with the first two wettings will subdue the staring aspect, this may be continued along the graft and bring up the figure or curl more prominently. Often between the curves each end of the graft repairers force very strong stain, this being sometimes common writing ink; when varnished over the effect is violent and common even when nicely done. The best that can be recommended is some sufficiently dark wood stain—sold at most of the oil and colourmen's shops—and rub it in, allowing it to dry and then finishing off as before described.

If the neck is to be left unvarnished, as it is termed, the colouring and fining off can be followed with a rubbing of good oil, linseed, raw or boiled, it must be really rubbed in and vigorously frictioned up and down with a dry cloth—or after an application of the same kind with some old fine flannel. This will drive in the

oil, consolidating the whole, and as it will dry inside after a time, keep a good smooth surface under usage.

Some repairers continue to varnish or polish along the sides of the fingerboard to the extremity. There is no objection to this, and if very neatly done, the general effect is enhanced. The varnishing of the whole of the fingerboard is perhaps not so good in general, too much glare seeming to obtrude itself, but the filling up the pores with the varnish and then working it down to a dull surface has a good effect and helps in the resistance to wear. The polishing of the neck, or fingerboard with it, may be effected by making a small ball or dabber of about half an inch in diameter of fine grained flannel; this should be covered with another surface of closer material such as calico, but large enough to enclose the little bunch and to be tied up with a piece of string. A portion of varnish being placed ready in a smaller saucer or any convenient porcelain article with a shallow even bottom, the ball or dabber will be moistened with some linseed oil and then its rounded face dipped in the varnish and rubbed briskly, but lightly, over the surfaces to be polished. These surfaces rapidly absorb the polish, while the oil in the dabber allows it to pass over without clinging. The rubbing should be continued until a smooth, glassy appearance comes and you feel sure that the wood has imbibed enough of the polish; this treatment may be continued over all the parts at which it may be desirable to have an even shining surface. The work may now be put aside for some hours, so that the evaporating and hardening may take place. When this has been ascertained to be satisfactory, the surfaces may be wiped gently with some soft, absorbent material which will take away any superfluous particles of oil that may have been accidentally left in the process of rubbing. If there should be some uneven, clotted, or rough parts observable, a small ball or dabber made in the same way as the preceding, but used with spirit and oil instead of varnish, will work these down to a proper condition. For the dead surfacing, care must be taken that all is

quite hard enough. Taking a small piece of flannel of fine texture doubled up and with its face well oiled, having some rotten-stone powder at hand, dip in the latter and rub as before lightly round and round over the parts to be dead polished ; this will give a nice refined, even appearance, with comparatively little glare. A final wipe off with a soft cloth as before, will bring matters to a conclusion.

CHAPTER VIII.

INJURIES THAT CAN BE REPAIRED FROM THE OUTSIDE—INSERTION OF FRESH WOOD IN FRACTURE OF THE RIBS—THE EFFECTS OF CLIMATE ON THE GLUE IN VIOLINS.

WE may now take this portion of the work as finished and turn to the consideration of repairs of fractures or filling up of parts last. It is early yet to think of opening the instrument for the purpose of rectification of anything that appears to have gone wrong either with the general structure or with small details. A golden rule to be observed by all repairers is that of never opening an instrument—that is removing the upper or lower table—until all other means of correction have proved futile. Extensive repairs to the interior may be accomplished without opening after a very careful look over with proper calculation. There are several reasons for keeping the above rule well in mind, among them, that if the violin is old and has undergone much affliction while under the hands of many doctors, some of these possibly belonging to the "heroic school," it may be found that the last visitant of the interior had straightened, bent, or contracted and held some of the parts together while the glue was in process of drying and that sufficient time had not elapsed since the occurrence for the strained parts to settle down under their new condition. An opening of the violin, removal of upper or lower table or any large portion, must be undertaken after due consideration and every precaution

has been taken that nothing shall be disturbed if the reparation can be accomplished without. An opening of the instrument for the purpose of one repair may lead to the necessity of half a dozen before closing up again. Our opening ceremony will therefore be postponed until a future occasion, and we will confine ourselves to the consideration of such external injuries of ancient or recent origin that may be with the least inconvenience restored to ordinary health or even strength. The numbers of such and their varieties are more than can be related, the curious manner of their occurrence, too, would be an addition that would indefinitely prolong the story.

Taking, therefore, small injuries or fractures that can be repaired from the outside, among the first coming to mind and not infrequently seen, is at the corners, a small piece of the projecting part of the rib—one of the upper or lower sets; this may have caught against something and got lifted away from the block, it may be on one side or the other, in size perhaps little more than an eighth of an inch, but all the same requiring immediate attention, or dirt will get in and make an adjourned repair more difficult if not wholly impossible to obscure.

According to the condition, age and date of the injury, so the treatment must be. If the injury is quite recent and the fractures are quite clean, some good thick glue placed on the exposed surface and the lifted piece placed back in position may remain there with no further attention than the wiping off when dry of any superfluous glue that may have exuded when pressing the part on. This has been a simple matter, but if the part knocked away is lost, a different course must be pursued. As it would be impossible to find a piece of fresh wood to fit a ragged or irregular-shaped hollow, there is but one method to proceed upon, that of clearing a regular space with a sharp pointed knife. The walls of the space or opening should be as clean in line as possible, also quite vertical. A small keen-edged chisel may be found advantageous, as, by its aid, using it with the angular or sharpened side downwards, the floor of the excavation can be reduced to

a fair level. This hollowing-out should not be too deep, leaving as much as possible of the bare wood uncut, only enough being removed for a good holding surface. If this is done neatly, the opening will be like that of a box into which will be fitted the fresh wood. As to this last it should be selected to match both with regard to texture and age whenever possible, also in continuation of the run of the grain, so that when fitted it should look as much like the surrounding wood as possible, that is, when free of varnish. In cutting the wood to the required size it should not, as in the instance of the aperture, be made with perfectly upright sides, but the parts that are to go into the aperture should be a fraction less than the outer, so as to allow of its being pressed in and fitting very closely all round. As the parts under consideration lie in the curved parts on the structure, to fit a piece in with success, it should also be bent with a requisite curve; if this is not attended to, and the clear varnish comes over it when being finished off, there will be a glistening of the grain underneath when shifted about in the light. To avoid this, which is apt to draw attention to the repaired parts, a larger piece of veneer than necessary should be first bent into the proper curve and the part nearly small enough cut from it and then made to fit. The bending of the piece can be effected by steeping it in some hot water, pressing it into form; being but a small portion, it will probably retain its inclination; if large enough and obstinate it must be kept bent by some means until dry, when it will show no disposition to revert back to its old form. If these particulars are all attended to with care, the piece of wood or veneer will only require a little pressure—the opening being gone over with strong glue —to retain its form in proper position. In case of failure under these conditions and the parts not holding together as they should, another course must be adopted.

It will be most likely that some grease is the cause of the non-adherence of the parts. The remedy will be that of using a little benzine on a brush and wiping or mopping out with a small piece of linen on the end of a pointed stick

of soft wood, after which, when quite dry, some fresh glue must be applied, and the parts pressed together and held in position.

Ingenuity and the perception of the adaptation of means to an end will constantly be called into exercise, and at a part of the instrument such as is at present under consideration, will be often severely taxed. Want of purchase or no direct pressure being possible, or at least perceptible, will be the complaint of the operator, but this can always be overcome with a little patience.

Now supposing that a piece has come off at the upper part of the waist curve, and if narrow or the curve is sudden it will at first sight be a little puzzling as to keeping pressure on the fresh part, even if cut sharply and ready to be deftly inserted. The difficulties will be considerably lessened, if not disposed of, if we take up a portion of soft pine or poplar, cut it in a moment or two to shape, so as to very loosely fit the upper curve or part we are about to glue, and not quite reaching the lower or usually larger curve of the waist; a small piece of cork placed between the wood to be inserted and that which is to press it while in position and another piece of cork of a wedge form can be squeezed in at the other end, so as to prevent the varnish being injured and to tighten the pressure, which will not be necessarily great if the fitting is good.

Another kind of repair not unfrequently necessary, and which should not be delayed, is caused by the parting of the two ribs at the angle, in consequence often of accidental knocks and over weak glue. This is a more difficult part at which to get direct pressure than almost any part of the instrument. Many repairers would lift up the loose part or parts, both being occasionally loose, brush a little glue in, squeeze the parts together and leave them. When dry the ends will under this treatment seldom be found to meet properly as in their original condition. The best mode of repairing will be found that of proceeding by degrees, overcoming the enemy in detail. Thus firstly, we must observe whether the junction or

construction of this part has been effected in the old Brescian manner—that is, the two equal parts being brought together, or according to the later method, the end of the middle rib being placed in position first, trimmed to a feather edge and the upper left thick and slightly overlapping it and afterwards trimmed into shape. In both instances the under surfaces must be cleaned and all the hard old glue softened and cleared out, if unfractured the surfaces of both corner block and rib fitting will be as originally left by the maker. In either style of construction it will be best to proceed first with the middle rib and support or prop it against the block in the way before mentioned. When quite dry we can remove the pressure and get to work at the other. After being quite sure that no hard glue or foreign particles remain between the surfaces to prevent a perfect fit as in the original condition, a small mould cut from soft wood again and of a size and shape that will fit loosely the semi-circular part must be cut, and some soft paper got ready to go between as a protection for the varnished part. If the parts are not much worn away, or the front and back plates are in fair condition, the rib may be glued and the screw cramp, cork or paper of course being used as a protector, and the rib will be held in position. If this is not sufficient for getting a close and accurate fit, the soft wood mould mentioned above must be placed, and a slight pressure gained by a wedge of wood gently inserted and pressed home. This mode of repair, it will be borne in mind, is when the upper and lower plates are in fairly good condition. Different treatment would be adopted if both were separated or the upper one taken off.

Sometimes the cramping, although sufficient for getting a good mend where there is a good extent of surface, will not be quite the thing for a small part, perhaps a slight opening at the extreme edge; in this instance a wooden mould, cut in a few minutes from a flat board large enough to allow of an oval aperture being made that will admit of the body of the violin being passed through. This being done and a small wedge being here and there judiciously

inserted, will enable the operator to get enough purchase, or advantage may be taken of the juxtaposition of the cramp, and using both to gain the requisite pressure against the bend of the rib in the manner before mentioned.

There are as a matter of course extremely numerous kinds of fractures or injuries arising from almost as many different causes. If time and space permitted, they might be classified and each credited to their different agencies. Sufficient for our purpose, however, will be the separation of them into three divisions: firstly, those which may be the outcome or result of ordinary wear and giving way of parts through atmospheric influence, such as damp or excessive dryness, or both at times, in combination with varying temperature. People are apt to debit the climate of Britain with many shortcomings and the cause of much undoing of good work in the fiddle world and the prevention of its being accomplished in the concluding stages of fiddle facture.

Much of the good quality attached to Italian instruments has been attributed to the beautiful and dry air of Italy. Now that Italy has beautiful air no one can deny, that is, while not standing in the streets of some of the most interesting cities therein, but that it is dry generally is perhaps going beyond the mark; remember it is a very mountainous place with some exceptional portions, this may be easily verified by a glance over a good map of the place, or better, a tour by railway from the northern provinces down as far as Naples. Knowledge is fairly general as to mountainous districts, much more than plains, being the localities where rain is most frequent, the more or less saturation of the atmosphere following as a matter of course.

But let Italian fiddles speak for themselves, otherwise than through the medium of gut strings. The first makers of violins in Brescia used no side linings, but trusted to the most excellent quality of their glue for holding back and front to the ribs. That their trust was not misplaced in many instances is proved by the work in its primitive condition remaining intact to the present

day. With the rise of the Cremonese school, delicacy in treatment of detail became fashionable; makers found that in order to give expression to their ideas in as many particulars as possible over the work, especially in respect of refinement in the curving of the ribs, less thickness of wood in these parts would have to be used, especially when of very decided curl; but this would not hold well except in the driest districts. The system was then introduced of using the thin slips of wood running from block to block; the thickness of these, although slight, added to the thin substance of the rib, allowed a better holding power to back and front.

The fact is here evident that the glue, of exceeding good quality—and that it was so will be corroborated by all repairers who have had to do with the old Italian instruments—was too easily affected by the damp of the atmosphere.

Further evidence frequently turns up among the great numbers of old Italian instruments gathered from all sorts of places, of the efforts at combating the effects of damp. Some of the means adopted by various repairers, apparently in the smaller towns—judging by the bad, even extraordinary woods used—have been very curious, many interesting, others primitive, even stupid. At about the same time the Amatis were introducing the use of side-linings, Giov. Maggini was trying other means of preventing the parting of the upper and lower tables from the ribs by damp. A method he adopted, and which many later makers imitated—if it did not occur to them spontaneously—was by cutting a groove all round and inserting the ribs. It will be obvious from this that no linings were used in these instances. That his efforts were not followed by success may be concluded from the fact that he did not persevere with the system. The simple method of his master was fallen back upon and thicker ribs placed in position. When we come across one of those grooved tables it will probably be found—as might have been anticipated by Maggini had he known beforehand of the course to be taken by his art, which

was at the time almost a local one—that a repairer has at one time thought it necessary to lift the ribs from one or the other plate, and almost, of course, bungled over it. This will be seen in the irregularity of the fitting of the ribs, which have been ruthlessly cut or torn out of the groove, some portions being left in. Taking them out was found to be unprofitable work, with a general result of a wretched wreck remaining, instead of the whole original being there but shifted a little, from the glue losing its hold while perishing from the action of moisture.

CHAPTER IX.

THE GLUE USED BY THE EARLY ITALIAN MAKERS—INSERTION OF PIECES OF WOOD FOR REPAIRING LOST PARTS—REPLACING LOST RIB AND REPAIRING INTERIOR WITHOUT OPENING WHEN POSSIBLE—SECURING LOOSE LOWER RIB TO END BLOCK—DIFFERENT METHODS—TREATMENT OF WORM-HOLES—FIXING ON GRAFT ON NECK.

HERE, before proceeding further, it may be as well to call attention to the kind of damage done by the atmosphere. We speak of the glue perishing. Under most circumstances this will not occur, but under exceptional ones it will. If good in the first instance, it will be perfectly sound and strong as ever at the end of three hundred years. I have found this to be so in the work of Gasparo da Salo and his pupil, Giovanni Paolo Maggini, besides other makers nearly contemporary. What particular kind of glue they used I am unable to say, possibly they did not know very much more themselves beyond what they believed was the best obtainable in their day and city. When the perishing has occurred there must have been very much moisture in the atmosphere of the locality in which the violin rested for some time, as the best glue will absorb the most moisture before losing its firmness, or power of adherence. Prolonged exposure to damp allows chemical change to take place and then all adhesive quality is lost; when dry air afterwards attacks it the parts of the instrument that should have been held firmly together are released,

with results that may be serious in degree according to the position of the part affected.

To continue the consideration of the repair of a violin that has been constructed with grooves for holding the ribs. A long and troublesome piece of work would be the loosening and taking away of the fragments of rib inserted in the groove and cut away by some repairer from the rest or standing rib; it is therefore preferable in ordinary and neat repairing to clear the parts that may be ragged or begrimed, firstly, by washing with a stiff brush of appropriate size and wiping with a clean cotton rag repeatedly; when the rag ceases to be soiled or discoloured after wiping, the parts may be taken as fairly clean. A sharp knife will take off any projections that may be prominent and prevent the proper placing of the rib in position; if the irregularities give indication of fitting well, the parts may have at their approaching edges a touching with strong, hot glue, and the cramps with protection applied as before for other joinings.

The probabilities, however, are, that through bad treatment, added to wear and tear, the parts will not fit under any circumstances, then the only course will be to make an even surface at the part broken away, and then fit a piece of fresh wood therein. If the aperture made is not of large extent and not wide, or more than the thickness of an average piece of veneer is required, then the fresh wood need not be bent, but cut neatly for fitting, and after glueing, as usual, slipped in with a part projecting beyond the surrounding surface. When quite dry it may be pared down carefully with a sharp knife, or if not manageable on the curve of the rib, a chisel of size according to the amount of room; being a narrow slip, after the colouring down and varnishing has taken place, it will be but slightly noticeable. The same treatment can, of course, be adopted for either upper or lower part of the rib; the middle rib position will give the most trouble, owing to its concavity, but care and patience will overcome the difficulties of the

situation. Should there have happened an accident by which a hole of some extent is rent in the ribs—either upper, lower, or middle—it is not absolutely necessary that the instrument be opened to accomplish the repair; bear in mind the advice given before, not to open a violin which has been in good going order if the repair can be effected without.

As we are presumably working on disabled violins that are valuable, perhaps old friends, or interesting specimens of a particular school, to select the best mode of restoration is our aim. For this purpose we will call to our aid some low class violin, new or old, that is of no value except for our purpose. If several are within reach we can select one with wood that matches as near as possible the one under process of restoration. Being already bent to shape, a portion may be found somewhere about it, that with a little exercise of judgment can be cut out to shape, and as in manner pointed out before, be placed over the aperture of the fracture. Care must be taken that it quite covers the part, while being likely to fit sufficiently well as regards figure or curl and direction of grain. The sides cleanly cut should not be quite vertical with the general plane, the inner surface being a shade smaller than the outer, thus enabling the operator, with a little pressure, to insert it, when glued, quite neatly. No instructions or suggestions with regard to fitting will counterbalance clumsiness of handling. In operations of this kind, delicacy of handling equal to anything required in watch repairing will be obligatory, that is if restoration of a high class is intended.

It would be impossible to deal with, touch upon, or even to recount every possible injury to a violin that might be repaired without the removal of the upper table, but there are still some remaining that will be worth considering, if only for the purpose of restraining the tendency to open the instrument upon too trivial a pretext. One instance occurs to memory at the present moment, in which a violin, the constant companion and closest friend of its owner, met with an accident that

seemed to him well-nigh total destruction, at any rate, necessitating much renewal with undoing and plastering up of fractures. To the fiddle physician it was promptly taken, carefully scanned, and the owner told that it would be all right in a few days. Will it have to be taken all to pieces? asked the anxious owner. Not if it can be possibly helped, was the reply. The violin was called for in due time, and in answer to inquiries it was fetched and seen to be in as good going order as before the time of the accident. There was no apparent evidence of damage, no sign of fracture or any neatly-laid patches, there were the ribs as sound as when new, no cracks to be seen. How did you manage that? said the owner, and you say there was no necessity to take the front off? Easier far, replied the repairer, the more there is left undisturbed the more assistance will these parts give you during the progress of restoration, and as you seem curious and desirous of solving the mystery of this renovation I will relate how it was accomplished. You are no doubt fully aware that your violin is of a size and shape well-known in the trade as a "Strad pattern;" well, there are thousands of violins in any number of degrees of quality similar in form and size, in fact, for us modern makers there are too many about. Catching the peculiarities of pattern with my eye at a glance, the difficulties to be overcome were not very numerous or great. I saw there was no reunion of parts of the ribs to be thought of, as they had gone, and your violin being a modern copy of ordinary pretensions, it would not serve our purpose to join four-fifths of new rib to the remainder, and so to make a clean and satisfactory renovation a fresh rib would best answer. Taking down from a shelf a number of loose parts of violins put aside for such occasions as the present, I soon found a middle rib that matched in most particulars those of your violin. It had the additional advantage of being better for the keeping, as regards colour or looking less new.

The first proceeding was to clear out all the useless fragments of the spoiled rib, search every corner and see

that there were no splinters left, and remove projecting particles of glue. All edges that were to come in contact with the fresh rib were washed, and where permissible, the surfaces made even by a slight levelling, finely shaving them with a sharp tool. The fresh rib was then tried, and being of full size and requiring more than the least pressure to get it placed, some little shaving down here and there was found necessary, and when done it was tried again carefully and repeated perhaps three or four times, when all parts seemed to fit sufficiently well. Each time the rib was inserted there was, of course, nothing projecting whereby it might be withdrawn; to accomplish this, a bent wire of sufficient strength passed through the most distant of the two sound holes gave it a push out again. When the piece was found to fit with accuracy, little remained to do beyond glueing the edges that were to come together, and after seeing that every part was in right position, the screw cramps were applied with sufficient force and no more, the superfluous glue wiped away and the whole left to itself. When sufficient time had been allowed for drying, the cramps were removed, a little cleaning of parts effected and the fresh work varnished in a manner so as to match nearly as possible with the rest of the instrument, and there you have your violin with a fresh rib inserted without removing anything but the damaged part. It was really, as you may have perceived, the easiest way of working the thing, there being no secondary process to be gone through, nothing but cramping down, varnishing and finishing off.

Another instance comes to my mind of what can be done in the way of alteration of the interior without removing the upper table. It came within my own experience many years back, and the violin was one owned by myself at the time. It had got into a condition not unfrequently seen after bad repairing, that of the fingerboard sinking down too near the table through absence of proper support or sufficient grip of the end of the table where the neck is inserted. Being unable to

attend to the matter myself at the time, I sought the aid of a friend living close by, a clever amateur violin maker and mechanical constructor of other things beside. He was not very long setting matters right, and my violin seemed in no danger of further getting into disorder from the same cause. I asked him how he had managed the rectification of the matter; did he take the upper table off? "Oh no, without that. I simply opened or loosened the left side of the table about and above the upper corner, then, having cut and glued a slight thin wedge-shaped piece of wood, through the narrow opening caused by the loosening of the table, I passed it on a thin knife long enough to reach to the upper block, between which and the part of the upper table which was not holding I carefully thrust it and tucked it in, finally glueing and cramping again the part of the table that I had purposely loosened."

This was a clever operation, successful but very risky, and not to be lightly undertaken by anyone without much experience and even natural ability for mechanical adaptation of means to an end. There was much danger, from the narrowness of the approach to the work from the side opening, of missing the mark and dropping the piece of wood with great difficulty of recovery, and, further, the chance of cracking the upper table by straining the opening for the admission of knife and wedge of wood. I heard of the violin but a few days since, and have no reason to suppose there has been occasion to have any further repairs done.

Among other mishaps occurring at times, and which from their position seem difficult to remedy, is that of the lower rib becoming detached, or losing its hold on the block; this is more liable to take place when there is a join running up and past the tail pin hole. Both sides may be loose or one only. When, as in a great many of the old Italian violins, the rib is continuous, it very seldom gets detached. Here the advantage of simplicity of construction is made evident. The rib being of one piece running round the lower end right past the tail pin

was not, as too often supposed, done for a saving of time by one operation, but for strength and neatness. When in two parts, sometimes with a piece of purfling inserted —each side is subject to damage either by the tampering with the tail pin, the nut above, or during repeated removals of the upper table. Exposure to damp will, as a matter of course, affect the original glueing of these parts as soon as any other. The detachment from the block may remain unnoticed for some length of time, until getting worse by degrees one part may be seen to be lifted or warped away from the join. If without this appearance suspicion is aroused in some way as to looseness, it can be verified or not with little trouble by tapping with a felt-headed piano-hammer, when the sound, which should be quite solid, will, on the contrary, be rattling.

Seemingly the repair of this part is an awkward matter from the absence of any purchase for pressing the parts and retaining them in position when freshly glued. The difficulty is more apparent than real, as there are several ways of overcoming this obstacle. To begin with one. The tail pin will, of course, be removed; if fitting rather tightly and of good length, use may be made of it.

As usual all the parts to be glued must be cleansed by a brush and clean water, sopping up the moisture after each application, pressing repeatedly the loose parts until they seem to be clean enough. A piece of soft pine or poplar will now be cut that will be just wide enough to go easily over the parts lying over the block and which of course cover all the loose parts that require fixing: it may be a trifle under a quarter of an inch in thickness. One side must be shaped to fit the parts over the block when pressed against them and should be a sort of mould. A hole will now be pierced to admit the cylindrical part of the tail pin, or if not long enough, a made substitute with a similar rim. It should be tried by passing it through to the tail pin hole, and if it fits tight enough to sustain itself against some pulling we can proceed. The fit should be close enough so that

when the peg is passed through the hole in the mould and the latter pressed by this means against the rib or the two parts on to the block, all should be held firmly in position. Taking them apart again, strong glue should be applied by a brush to the surfaces that will meet or be worked in as when the cleansing was going on. The peg and the mould—with a piece of paper on its face to prevent adhesion—may then be pressed in to hold tight until hard and dry. The same method may be pursued with the exception that in place of the peg a screw—if one is to hand large enough—may be inserted. In this case it should be a very loose fit to the hole, the grip will be obtained by rolling up a piece of paper and inserting it in the tail pin hole, the screw can then be used against this inside without damaging the block.

Another way of accomplishing the desired result will be by a stout leather strap and buckle passed round over all the ribs of the instrument ; the same sort of mould will be used and applied in the same manner. The strap will need holding in position at the upper or neck end over the button, a string over the fingerboard will be sufficient ; at the other end over the mould a wedge of soft wood according to size will enable the pressure towards the block to be regulated. Another contrivance with the same mould, for this must always be used, is by getting a wire with a turned or screwed end fitted with a head or nut, the other end can be bent to right angles, but not too much length used or it will not go through the tail pin hole. When in position, having been passed through the hole in the mould, the right angled or bent end will catch against the inner surface of the block, the head or nut being then screwed round will tighten and press the mould towards the block with enough grip for the purpose if all the rest is in proper order.

Should these contrivances not be to hand or are found inconvenient, yet another method is that of using the screw-cramp. A portion of mill-board or cork being placed to protect the parts of the upper and lower table between which the end block is situated, the screw can

be turned tight enough to allow of a wedge of wood being inserted between the back of the cramp and the mould without risk of shifting; it can then be left until dry and hard.

Occasionally there will be not only the detachment from the block, but there will be the accompaniment of a split in the rib. There will be in this instance a preliminary cleansing of the split and joining together before proceeding with the other part. The reason for doing this is that the pressure on towards the block is apt to widen instead of closing the crack. The most usual way of mending a crack, or there may be more than one, is by the use of a small hand vice. A piece of stout card placed between the teeth of the vice to prevent an imprint, the part to be joined will, after cleaning and glueing, be brought closely as possible together and the vice screwed up. For this process the help of another person will be almost absolutely necessary, as two hands will be required for holding the parts together while the second person holds the vice and turns the screw to order. When dry and unscrewed the parts joined will require a little scraping of the superfluous glue, washing away at a thin part as this is would be dangerous; if brought together neatly the rib can then be pressed on the block in the manner before explained.

The same process will be gone through when a portion of fresh rib has to be inserted at this part, owing to loss of a piece through violence or the ravages of the worm. In the latter case searching inquiry should be made with a pointed wire or pin and the direction of the boring operations ascertained, as it may be necessary to insert a larger piece than was originally intended to avoid a large smash or general collapse at the part where the greatest strength should be. There is often too great a tendency shown in repairing, especially in preparation for the market, as, for instance, when an old master has been unearthed in some farmhouse or out of the way place on the Continent, to make a clean sweep of a somewhat riddled part, the repairer trusting too much to his

imitative powers on new wood with new varnish, and we may say with new ideas on old facts; it is seldom that the result is far from hideous. Better trace the tortuous course of a whole family of worms and fill up with a cement or plugging than, as is too often the case, cut a hugh slice away, for if so the instrument according to the extent begins to assume a composite character, it may be ten out of twelve parts gem of an old master and two parts modern trash, hateful to the eye of the connoisseur.

While touching upon the subject of worm-holes, a few words more may not be out of place when contemplating the raavges of these voracious creatures. Almost all devotees to the "gentle art" of fiddling have a great horror of the possible presence or the ungauged depths of the mysterious tunnellings the entrance or exit to which will cause a start of dismay in a searcher after the beautiful, when, in an otherwise perfectly preserved specimen of art by one of the giants of old, his eye alights upon that sharply defined circular hole, cut with no uncertainty of purpose, but with a ruinous intent, for it is business with the boring party to consume the whole, if possible, at its leisure and in quietude. This last is an important item in the consideration of the circumstances under which the "gem of art, old master, Cremona, real Strad," or whatever title the wooden structure may have been sailing under. Those who have suffered much from the Italian fiddle-hunting mania—a condition mostly chronic or quite incurable—but who may have kept their "considerating cap" well poised on their head, will know that the worm-eaten fiddles are often devoid of evidence of usage, sometimes even in the absolute sense of the term.

Such a one we may suppose before us now; after lying neglected for generations, or since the time when it was bought by one of our periwigged ancestors from the maker, perhaps after a little haggling about the price, which most likely was one hundredth part of its commercial value at present. It was placed many years since in its present comfortable case, after being

taken out of the old ragged leather covered one, with the brass nails along its side. Tradition has it that in long bye-gone days it used to hang suspended from a nail in the oak panelling of the "old house at home," but that during a more recent generation and less musical one, it was placed aside in the old case, as being somewhat interesting from having been brought over to England from some place in Italy during the reign of James II. Later on it was taken from this old case, and placed in one of modern construction, and occasionally was taken out for musical people to see, some of whom expressed their admiration for its elegant form, others for the singular transparency of its varnish. None had come forward with the request to hear what it had to say for itself or what its tone was. But the day came round at last when someone more inquisitive than usual, by nature as well as by training, having inquired as to the possibility of seeing the antiquity, was afforded the rare opportunity and treat of seeing a perfectly preserved Cremona, nearly as possible untouched; the connoisseur was informed that no one had been known to have played upon it. The case is brought forward and opened, the violin, with perhaps one very brown string dangling from it, is taken gently up, the left hand encircling the neck, while the forefingers and thumb of the right, hold the lower part near the tail-piece.

The violin is turned first one way, then the other, and sideways for viewing the ribs and the beautiful play of light through the varnish, the fine curl of the maple with the slightest movement, almost giving an impression of hastily shifting from one row to another, in fact, looking as if the wood were gifted with life. Steadily turning it about, the connoisseur at last breaks out with the exclamation, this is the most wonderful thing I have met with in my life, it is almost perfect, practically new, looks, perhaps, but a dozen years old. What a beautiful design, what colour, and splendid wood, both the pine and maple, the workmanship, too, having that wonderful freedom of handling which moderns find so

impassable a barrier to success with their "imitations of the antique!" Lost in admiration for some minutes, the connoisseur's critical faculties after a while begin to assert themselves, and he is on the look out for flaws or defects that may mar the completeness of the whole; it might be a little more this or that with advantage, not quite so fine in one respect, although perhaps better in another than the one owned by his friend Smith; but oh! a wormhole! that settles it, done for! perhaps the thing is riddled, or even "honeycombed" in parts. The delight at finding a work of art in apparently so perfect condition is succeeded by a more than counterbalancing sense of frustrated hopes, schemes for acquisition of the gem being dissipated at once by that small circular opening just at the under part of the edging there near the corner. Our friend takes his departure, but cannot help talking of the "find" to the dealer and repairer of whom he purchases his strings. This person takes another view of the affair, and resolves to see the thing and perhaps acquire possession, so that like his customer, he gets permission to inspect the violin. It is brought out as in the other instance and he turns it about, gives it a sly pinch here and there, looks for any light coloured dust or powder inside and does not see any, a shake or two with the same result. The subject of parting with the instrument at a fair price is at length broached to the owner, who would like to know what Mr.——would be prepared to give for it, but this party means business and not valuation gratis for the owner; he therefore dilates upon the difficulties attending the keeping of a large stock of such articles, besides the thing having been bored so much by worms can never take its place again among prominent examples of the maker, and it would want a lot of playing upon even if possibly well restored. M.—— finally departs as owner of a finely preserved Cremona violin, not exactly for a "mere song," but a few judiciously selected sentences and fewer pounds. Out of the house his steps are lighter and swifter as he gets nearer his premises. When arrived he takes it to the repairing room;

removing it from the case he again examines it, and with a smile says to his chief repairing help—here, what d'ye think of that? This workman, who has not studied as an enthusiastic connoisseur during the many years of his working on the premises, takes it up, looks it well over, and then observes—"well, at first I thought it was a good modern copy, but now if I don't think it's a real one! Well, I never! it is, too! look at that stuff all over it." This was his manner of criticising varnish when it seemed to him of good quality. "I would like to have some of that! a worm-hole though. Don't know how far that goes." "We'll soon see," says the other. After a few turns over again amidst remarks of admiration expressed in different ways, the fiddle is brought into a good light and preparations made for opening it. "Why, I don't think it's ever been opened before," says one. "Certainly not," says the other. "Now," says the dealer, "you had better do it," and the workman proceeds thus—first removing the tailpiece and with a "post setter" lifting the sound post out carefully through the right sound hole, he removes the tail pin, and holding the instrument to let as much light as possible into the interior, looks through the pin hole and observes—"No patch in this, Mr.——, fresh as a new-laid egg—original bar too,—however, let's go ahead." The fiddle is then laid face downwards on a cushion or soft pad and held in position with the extended palm of the hand. The operator then takes what has been once in use as a table knife, but is now thin and smooth with wear, keeping the left hand firmly in position and the knife in the other, he casts his eye round for any portion that may seem looser or more lightly glued than the rest. It has been very neatly done however, and one part seems as good as another. "Stop a moment," says his companion, "let's have another look inside, maybe we shall see how the worms have been going about by the light passing through."

It is taken again to a window; the sun fortunately is streaming in and so enables master and man to proceed

under favourable conditions. The dealer patiently turns the violin about so that the rays of the sun may penetrate wherever possible through the material; after a while he hands the violin to his workman—"you have a look, James, I cannot see any traces—I don't think the worm has gone very far, seemingly only a short distance from the opening." James looking again, and coming to the same conclusion, the violin is again taken to the operating table and the knife taken in hand.

CHAPTER X.

WAYS OF REMOVING THE UPPER TABLE AND THE NECK—CLEANSING THE INTERIOR—PRESERVATION OF THE ORIGINAL LABEL—CLOSING OF CRACKS IN UPPER TABLE.

I RECOLLECT many years back, when in company with a violinist of some note, we were talking over various details in connection with the reparation and regulation of violins of a high class, particularly those of the great masters. The fact of so many fine instruments having fractures of the same kind and in the same position was remarked as being curious, why so numerous as to form a very large majority? Well, said the professor, at one time cracks were really fashionable, and an instrument well endowed with them was thought to emit its tone more freely, especially if it had been somewhat stiff before. This might account for some, but not so many coming from all parts, I observed, from their similarity I am inclined to their being due to one principal cause, that of carelessness on the part of repairers in former times and some even of the present. It is through hurry or want of method in removing the upper table, should it be necessary. A repairer once confessed to me that he had sometimes caused these fractures in his impetuousness while going through this preliminary; his excuse was one frequently made for all sorts of bad work, clumsiness and want of judgment, that people would not pay for proper time and care being expended, and so when he cracked the front while taking it off, he glued it up again.

As generally is the case, more than one method can be pursued for removal of the upper table. A somewhat original one was recommended to me once as being very successful and causing the table to part from the rest beautifully without risk of fracture, and that was, firstly to obtain some vessel holding boiling water and with a suitable pipe attached for throwing a fine jet of steam against the glued parts requiring separation. Not having seen this done, or tried it myself, I am unable to speak for or against this process, but there appears to be some risk of damaging the varnish in the vicinity while the steam is forced against the small space for operating upon. I was assured that this was an excellent mode of separation, there being no tearing about or splintering of the wood. It might be a good method where there is perceptibly much impasto of glue, and which, while almost readily yielding to the penetrative power of steam, is a great nuisance under ordinary circumstances. Another method would be that of getting some lengths of soft cotton rag or other substance that would retain moisture well when wetted; these could be laid all round, tucked closely against the junction of the upper table and ribs and left for a reasonable time or kept wetted in dry weather. This, if not quite causing a disjunction, would facilitate the operation of the knife in the usual way. I think, however, that any departure from the rule of using the knife is very rare indeed, any other means necessarily taking time and taxing the patience.

We will now return to the dealer and his assistant or repairer. The matter in hand with them is business, and therefore a regular routine is gone through when the instrument is worthy of first class repair, and everything conducive to the best results in up-to-date regulation has to be calculated and carried out in minute detail. Searching eyes will go over all the fresh parts, looking for any possible inaccuracy, any slip of the tool or ruggedness where a fine, even surface ought to be. In order that all may be conveniently attended to, the first proceeding will be that of sawing off the head and neck,

this is done rather close to the body of the instrument. Under present circumstances, more care than usual with modern violins has to be exercised, as the repairer knows that it was customary with the old Italian makers to secure the neck to the upper block by one, two, or at times even three nails. They were driven in from the interior before the final closing up or fixing of the upper table. Sometimes a screw is found in the same place instead of nails. These arrangements point to a want of confidence in glue by these old masters, notwithstanding the evidence we have of their using the finest quality only. In separating the neck from the body, it will obviously be wise to act in a very cautious manner, or the saw may come suddenly upon the nails or screw, and there will be a grating of teeth, and perhaps upsetting of the temper of the performer. It will therefore be a consideration for the repairer whether the instrument has been previously opened, or is in that very rare condition, as the maker left it. Economy of time and labour always more or less being a desideratum, in the supposed instance before us, that of an untouched old master, our repairer having had experience with many Italian violins of different degrees of merit, first proceeds by removing the old fingerboard. This being short and less massive than the modern kind, presents but little difficulty. The cushion filled with sawdust or sand, is now called into requisition. Placing the violin on its back and tilting it up so that the button and the back of the scroll press equally on the yielding surface, it is held in position with some degree of firmness, the fingers of the right hand being placed underneath the wide end of the fingerboard, a sudden pull upward causes the fingerboard in most instances to part with a snap. Should it refuse to do so, other means must be resorted to. The fingerboard may be one of the old inlaid kind, or veneered pine, and worth keeping as a curiosity, in which case the saw must be applied to any part of the neck for removing wood that will not be required again, piece-meal, until the board is free, when it can be further cleared at leisure.

Our repairer, not finding in the fingerboard under his hands any particular merit, it being besides worn into ruts near the nut by performers of the early schools, who used but little more than the first position, moreover, coming away with ease, proceeds to the sawing process. The presence of nails or screw he believes to be fairly certain, therefore instead of sawing down close and even as possible with the ribs, the saw line is made at an angle downward and outward toward the head, or say at an

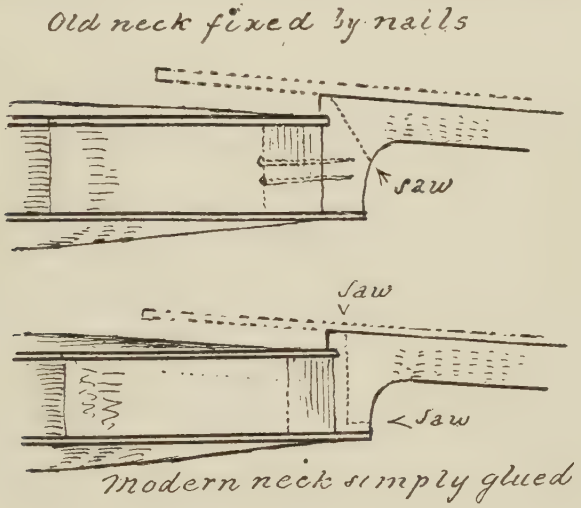


DIAGRAM 35.

angle of some forty-five degrees, beginning at about a quarter of an inch away from the borders of the upper table. The cut thus made would be free from any nail or screw, unless of extraordinary dimensions. (Diag. 35.)

In the case of a modern violin, the saw cut could be made close to the border and downward to within a short distance of the button, where another cut at right angles and parallel to the surface of it will free the neck com-

pletely. The violin, now as before, is placed front downwards on the cushion or pad, some repairers would hold it on their knees, but only in the absence of either means. In the present instance, being a prize and sure to eventually pay for any amount of trouble and skill expended, the violin is treated in a manner that long experience and judgment dictate as safest. Opening the instrument has been agreed to as being absolutely necessary, the old short bar would certainly prove inadequate to withstand the pressure from above if the violin and its fittings were to be subjected to modern regulation under present conditions. Everything being ready, the operator with steady hands inserts the knife with a sudden push at the under part of the edging—from the position of the violin the knife would now be above it—at the lower quarter of the instrument, this having the largest curve and therefore being weakest in resistance to the plunge of the knife. As the thin bladed knife is worked along, there is a tendency to stick occasionally. This is counteracted by running along, or slightly wiping the surface of the knife, a cotton rag, with the smallest touch of oil upon it; this will enable the knife to go quite smoothly. Great care is exercised that the knife is held on an exact level with the plane of the pine table, or there will be great risk of running the knife into the pine instead of lifting it away from the joint. Evidence of bad judgment in this respect is not infrequently to be met with on otherwise well repaired instruments. A series of sharp cracking sounds come forth as the knife works its way in. It is worked along in either direction until near the corner block or near the nut. At this part, the violin being in the original state as fresh from the hand of its maker at Cremona, the treatment will be slightly different to what it would be after modern regulation.

The knife will come to a full stop here, and be taken out for proceeding with the release of the table on the opposite side. It will be as a matter of course, necessary to place the violin the other end foremost, the larger end

being furthest from the operator; the knife, as before, being inserted at the large curve in the same manner and for the same reason, finally stopping as before at each end. The principal reason for stopping at the end is that with most of the old Italian violins there is a short wooden pin, probably used for temporarily securing the table in position before the final glueing down. These wooden pins of hard or tough consistency being driven in firmly, offer considerable resistance to the passage of the knife if the latter is forced through. Most of the violins having these pins originally, give evidence of the exertions of the repairer to press the knife through these obstacles at the risk, ofttimes with certainty, of breaking up or smashing the fibres of the surrounding portion of the pine. Of a dozen old Italians, perhaps on an average ten will be found with this part broken, jagged, or having a portion of fresh wood inserted where ruffianly treatment has bruised the threads of the pine past remedy. Our professional repairers, being men of experience, further, both having a natural disposition and qualification for their calling, know better than to use much violence in this part of their work, so taking the knife away, the operator cleanses it from all glue or resinous particles, and when perfectly dry, passes the slightly oiled rag again over both surfaces. The knife being inserted again and again, is pressed round about the pin and thrust forward so that the increasing thickness of the blade may act as a long wedge, this gradually lifts the table away, leaving the pin standing.

The lower end will require the same treatment for easing the upper table round the pin. In original condition most of the old Italian violins would not give further trouble, but some later or middle period ones, instead of the small piece of ebony or other hard substance slightly inserted or laid half way through the table, have an ebony nut going quite through and down in a triangular form nearly to the tailpin. In these instances a small knife held vertically and pressed along between the parts of the ebony touching the pine will enable the table to come

away gradually in the manner indicated. We now may suppose ourselves again in the presence of the repairers, operator and master; the upper table has been successfully and cleanly released from the blocks and along the upper edging of the ribs, very few splinters here and there are left, giving double evidence of neat glueing on the part of the maker and systematic care on that of the modern repairer.

Being now quite free and gently lifted off, the table is turned about for a moment and attention is directed to the interior. The two men look at all the parts with very different eyes. One with eager expectancy, critical eye and much experience, sees at a glance much that intensely interests him, confirms certain views of the old methods of working, whether the wood was white and new when the violin was constructed, how a little of the precious material enveloping the whole structure had dropped through the sound holes during the process of varnishing; watches the form of the drops whether they indicate a thin or a thick solution of the resinous particles, whether these have cracked or blistered in the Milanese or Venetian manner, whether they show signs of having set at once or remained soft and running for a time; the corner and end blocks, their material, and whether the same as those linings let into the middle ones and their being finished off before or after the placing in position. The joint of the back too, and if there remained any evidence of system in working different to what we moderns would do? These and other queries passed rapidly through the mind of the dealer and connoisseur, more of the latter than the former, and that is why he was not more successful by many degrees than any others of the fraternity. To be a dealer in the strictly business sense of the term, a number of valuable violins must to him be no more than potatoes in a basket to a greengrocer, *i.e.*, what they appear worth.

His assistant—a good accurate mechanic in almost all respects, sees in this unearthed "old master," "gem of antiquity," or *chef d'œuvre* of Italian art, nothing but the

interior of a dirty brown box with a rolling ball of fluff resting in one of the corners.

There are perhaps few things more disappointing than the interior of a violin when opened for the purpose of repairing. Be it a matchless gem of Cremona's art or an old and common Tyrolese worth but a few shillings, the difference to an ordinary observer is so slight as to be uninteresting, indeed to connoisseurs of experience there is not the variation sufficient to excite curiosity to the extent of opening the instrument on that ground solely. The raw and unvarnished wood, with the parts between the threads swollen from damp, begrimed and repeatedly washed by repairers, presents anything but a pleasing spectacle even when the interior of a fine "Strad" or Joseph is laid bare. Many years ago a friend owning a fine Cremonese viola asked me to open it and find out the cause of some buzzing or rattling within that had not been evident till that time. After an examination, finding that opening it would be absolutely necessary, I asked him whether he would like to see the interior of what he had paid so much for; it might not prove an enjoyable sight from the roughness and dirt of ages in combination with clumsily executed repairs while in unskilful hands; being unaccustomed to such sights he wisely restrained his curiosity and waited till all was placed right again.

But to our dealer and workman again; the former, taking up the two portions alternately, at last makes the remark, "Clean work, James, inside as well as out, good tool work, they had some steel in those days, plenty of glass-papering here apparently, unlike some others made at the same period, time seems to have been no object. Possibly the maker was well paid for his work, if not he ought to have been." To these observations the workman only gives a sniff in reply. He thinks that all this can be quite equalled at the present day, if a fellow is really well paid; but this is reckoning with only a part of the subject. A further exclamation of admiration comes from his chief—"Think, James, what a wonderful

draughtsman this old Italian was; mind you, this is not a copy, traced from something else as we should do now-a-days, but a first idea, an original design; it is in some respects a departure from the man's best known patterns, good as them, however, although differing; look at the way those lines run from point to point, what ease! the tenderness with which the sound holes are drawn, the lightness and freedom! that man was a born artist if ever there was one!" Another sniff from James, who doesn't believe in born anything, but that good work comes with good tools and a reasonable prospect ahead of good remuneration for extra trouble. "Don't see, sir, why we can't put a bit of purfling round as clean as that! some of those French copies are as cleanly purfled as any part of this!" He is released from the necessity of further illustration by his chief interposing: "Quite true, James, and if these mechanical copyists had put as much energy into efforts at truly original and artistic designs as they have in copying that which seems to have been laid down for their guidance, they would have advanced very many steps further than they have done in the essentials of the art—in the highest sense of the term—of making violins. But we must get to work, there are lots of repairs of all sorts for us to get through the next fortnight, and as there is comparatively little anxious work about this job we will get it out of hand!"

The violin is now subjected to another and final inspection before the active treatment is commenced. "How about that wormhole, James, that we were worrying over before the separation of the upper table?" "That's just what I've been looking at, sir, and as it doesn't go more than a quarter of an inch into the wood —I've tried it with this bit of wire—the maker must have cut this bit of pine from a worm-eaten log, perhaps because it was old and likely to give a good tone!" "There you're wrong, James!" the chief interposes—he is rather inclined to snub his assistant when that essentially practical man gives any indication of a flight of fancy— "the 'worm' is no sign of age, I have known it to affect

wood that has been cut but a year before its discovery, and do you think those old Italians were such fools as to make fiddles that would be only fit to be heard when tried by their descendants two hundred years after they died?" James collapses, and getting a basin with some warm water, a cloth and a piece of sponge, proceeds to smear the latter up and down and round the sides of the instrument. The sponge and water soon show signs of the work in hand. "Very dirty, sir, hasn't been washed for a hundred years, I should think! There's a ticket, too, but I can't make out much of it. I'll wash it over a bit." He then begins to try the deciphering, taking one letter at a time. "There's a large H at one part, the next is A or O and then U or N, and next to it there's R or D; its either London or perhaps its one of those we came across the other day, Laurentius something." "It's neither one nor the other," his chief almost roars, while rapidly striding across the room to his assistant, who hastily hands over the portion of the violin, glad to leave the regions of speculation. "There's nothing about that fiddle having any connection with any place but Cremona," and the chief bumps down into a chair to further study the mysterious ticket. "You have not improved that ticket by washing it, the date has gone and the greater part of the print; you should never wash a ticket, that is how the very large majority of even well preserved ones have lost the date or part of it written with ink in which gum has been one of the ingredients and which is easily dissolved, the best way after dusting it is to get some bread and rub gently over the surface, and if that does not bring out the letters or figures you may mostly consider them past recovery."

James does not think much of this attempt at instilling wise maxims into his prosaic constitution, and replies "I don't think you could have seen more letters before I washed the ticket than after, sir, the plainest were what I read out, which looked more like London than anything else. There was another word underneath which I think was alum, that's English, isn't it?" This is intended as

a kind of parting shot in a contest during which he has been slightly uncomfortable. The chief answers rather snappishly, "No! that's Latin. I must tell you that at the time so many of the finest fiddles were made the use of Latin was very fashionable, being used much on monumental decorations, signatures to works of art generally, down to the prescriptions of doctors, which we have not got rid of yet; that is the former, the latter are always with us and will be. But stop! why, after all, this is not the original ticket, I think it is one pasted over another! hand me that camel hair brush and the water." This being done, the wetted brush is repeatedly passed over the ticket so as to keep it moist till the water has soaked through and dissolved sufficiently the glue or gum that held it close. After a while, the corner is gently lifted up with the aid of a pointed knife, the end caught hold of and pulled; by degrees the whole of the upper ticket is lifted off, leaving to the pleased eyes of the chief the original ticket in all the better preservation for being covered up. "Yes, there it is! I knew I was right, a fine Nicolas Amati! I believe that top one is the remains of a Laurentius Guadagnini Alumnus Stradivarius, which some wiseacre thought a more appropriate title."

The Guadagnini ticket is laid by till dry and then placed in a small drawer in which are a number of others of various makers and nationalities; it may emerge from its obscurity some day and become of use so far as the condition or its legibility will allow.

The upper table is taken in hand again by the chief, turned over repeatedly and both sides of the border carefully examined for the presence of any cracks, long or short, old or new, the latter being scarcely expected, as the assistant is of a sufficiently cautious disposition naturally and as yet has not been debited with any charge of injury to his work from over haste or carelessness. "There is a very small crack at the lower right side about one inch from the centre, I think, but let us be certain, have you got your glue in good order?" "Quite," is the reply, "fresh and strong too, sir." "Just

see if that mark is really a crack or not." The assistant takes the portion in hand, holds it to the light, examines it from different angles of vision, and finally resolves to test it in the following way; holding the plate of pine carefully with the left hand, with the right holding a "camel hair" dipped in clear water, he passes it over the possible crack, then taking the plate again in both hands, with the thumbs placed on each side of the mark, the fingers being underneath, it is very gently bent backward and forward, and the wetted part closely watched. Presently, the water is observed to gradually disappear, having worked its way into the crack. "It is one, sir, but quite clean as if newly done." By this time, the slight bending, or what is really the case, the opening and shutting of the crack by the movement, causes some minute white bubbles to appear along the course, these give an indication of the extent of the fracture, which is something over an inch in length. "I think it is the result of the contraction of the wood from being kept in such a dry place, it is not a repairer's crack, which would have extended further into the centre," so the chief observes, "get the hand vice ready with the paper, and I will hold the parts together." At this time, the fresh warm glue is being applied in a similar way to that of the clear water, the latter enables the glue to work in or follow the course of the moisture, and similar, but whiter, small bubbles are seen along the direction of the crack under the manipulation as before described. The small hand-vice, having several layers of stout white paper or card inserted at the opening or between the teeth, is slackened to receive the part of the border to be held together. The chief, holding the plate with the fractured part furthest from him, and consequently in front of his assistant, it is held in position firmly by both hands. "One moment, James!" he exclaims, "this border has had little or no wear, and the surface is so fresh, that if we use card or paper alone we shall leave a mark of the pressure, hand over those thin pieces of cork and let us put them between the paper and the metal of the vice,

there, that will be better for standing the pressure, more elastic you see." The vice under the fresh conditions is now applied, the parts of the table or plate are brought together accurately and held tightly in position by the fingers, the glue exuding from the crack where it can be seen just beyond the reach of the paper, the screw is turned tightly by the assistant, and with the remark, "that will do," the whole is left to him for placing aside while drying.

CHAPTER XI.

GETTING PARTS TOGETHER THAT APPARENTLY DO NOT FIT—THE USE OF BENZINE OR TURPENTINE—TREATMENT OF WARPED OR TWISTED LOWER TABLES.

"WE will now," says the chief, "have a look at that old Brescian violin that I bought last week, it is in that set of drawers by the bench there, the third from the top." The assistant gives a look in the direction that would strike a spectator as expressive of doubt whether a violin could be even squeezed by hard pressure into any of the drawers. Nevertheless he obeys, opens the drawer, and seeing only a brown paper parcel tied with thin string, takes it out and holding it up says, "do you mean this paper bag, sir?" "Yes, that is it." The paper bag is brought to the table at which the chief is sitting and who undoes the string and paper, letting loose a number of begrimed pieces of veneer-like wood, some of these fractured, the upper and lower tables comprising three parts, a head that some modern makers would think ugly enough to cause a nightmare, with its short heavy neck as left by the maker about three hundred years back. The condition of the whole concern was suggestive of its having been raked up from some out of the way dust heap that had, after the oblivion of a century, at last caught the eye of a modern sanitary inspector. There was only one sort of person to whom it would be at all inviting, that of our chief above mentioned. "Now that is what I call a bargain, James," he

begins, when turning over the pieces one by one; "all perfect, not a part lost. I bought it of a dealer in the country who said he could not get the parts together, they would not fit, and he was glad to get rid of the lot with as little loss as possible." James at this moment has been placing the two tables of the violin together and remarks, "I don't think these belong, sir, the back is nearly a quarter of an inch shorter than the front and narrower too." "Never mind that," is the answer, "the style is the same, the purfling, the work and the varnish are the same, it was all together at one time and looked well enough, and it will have to go together again and possibly look much better, and you will have to do it under my instruction, as you proceed, it will repay for all the trouble and time spent upon it by its appearance and tone. The man who sold it to me said that its former owner told him he had a good try at getting it together and failed. This is the direction in which they have both made their mistake, they treated the unmechanical old Italian work as they would a modern copy of a Cremonese maker, and which had been built upon a machine cut block that served for ever so many warehouse fiddles; these old Italians had to use the hand bow saw, which was not adapted, unless great care was taken, for getting very true upright sides, hence the upper and lower tables are as often as not differing in size, sometimes the upper is largest, at others the lower. Occasionally the length may be the same with the width differing. Now you had better set to work and wash all that muck from the pieces, be careful not to separate any parts that may be fairly well fixed. I want you to do this cleaning in my manner, not that which you were accustomed to before coming here. I know the too frequently pursued method of putting the whole collection of parts in a tub of water and there letting them float about until the glue has dissolved and left the wood, but the following is preferable. Firstly, get some hot water sufficient for your requirements as you proceed, renewing it occasionally. Your piece of sponge you always have ready, and your

cotton cloth as usual. I have cut down a hog hair brush of half-an-inch in width, you can use other sizes according to convenience. Being cut abruptly across, they can be used as small scrubbing brushes after dipping in the hot water. The advantage is that of your being enabled to leave untouched or even dry, certain parts which you are not desirous of interfering with. The occasional sopping up with the sponge and cloth will show the progress that is made. The dark, dirty glue of the modern fiddle tinker will gradually wash off, leaving frequently the ancient, light coloured stuff in quite a fresh state and sharply defined, further, it will sometimes give you a hint as to the exact position which the adjacent pieces held originally. There will not be any necessity for scrubbing very hard with the cut-down brushes; if this is done the surface of the wood will suffer; a little patience as one part after another is cleansed and the whole completely denuded of its covering of dirty glue and grime, and it will be perceptible that there is method in this, and consequently the most rapid real progress.

Occasionally there will be found in and about old repairings or tinkerings lumps of pitch-like substances, hard or soft as the occasion has seemed to the workman to require, or possibly the only stuff obtainable, if not with the idea of a damp resisting material. These, as you know, will be treated in your usual manner, that is, removing with a blunt knife for a large piece and a piece of fine flannel wetted with some pure benzine, which having a strong affinity for any oily particles, absorbs them rapidly and leaves a clean surface. Spirit of turpentine will also answer the purpose, but is less rapid in its action and does not evaporate so completely, leaving a slight residuum of resin. Alcohol of any degree of strength must be kept quite away from the work, as even supposing it specially adapted as a solvent for removing the objectionable material that may be found clinging anywhere, it has such destructive action upon the old Italian varnishes that the slightest drop on the surface will cause irreparable injury. Keep it quite clear

of your repairing work, it is not absolutely necessary under any circumstances, although it is very tempting to a slovenly repairer.

We will now suppose that the instructions have been duly carried out, the different parts have now resumed their original condition of cleanliness and have a wholesome aspect. One or two of the ribs left standing and even undisturbed since being placed in position by the maker about three centuries back, serve as a guide respecting the projection of the edging over the ribs. After carefully noting this, and damping round the inner edge, these are removed and placed aside. The chief and his assistant are now enabled to thoroughly examine the work of this product of a by-gone age. It is none the worse for being clean. The comments upon the tool-marks now visible after the dispersion of the grime are of a rather opposite character, the connoisseur noticing the manner of working over the surface by the old Italians as being different to that pursued now; the assistant sees nought but rough gougings and scratchings as with a notched or blunted tool, and concludes that the old makers were not as good workmen as the moderns. "Now, James," says the other, "you have been doing little else than repairing since you took up with this business, and have never had the opportunity of working a violin from the beginning, straight off the stocks, without being drawn away to some other work. Consequent upon this your work has not so much distinctive character, much effort at mere smoothness being apparent and in excess of good style. These old Italians were designing and making new violins day after day for their livelihood. Repairing, when they could make equally good, fresh instruments, was to them of secondary importance, and so we find restorations in the olden times were of a kind we should now call very indifferent, if not altogether bad."

The lower table or back of good sycamore is now turned about and well scrutinised by James, who now remarks, "this back is warped, I think that is why the

last two owners could not make the other parts fit well, what is to be done with it, we are not likely to make a better job of it than they were with a back twisted like that ?" The reply is, "that old Brescian maker was not likely to turn out a new violin with such a twisted spine ! that condition has arisen since and is not a constitutional defect, it has been caused by damp and straining, and being repaired while in the strained condition, it retained the twist ; we must alter that. Fortunately, the back is in one piece, so we shall not have the trouble about the joint, although with the necessary extra care the treatment would have to be much the same. Now, first of all, get a cotton cloth sufficiently large when folded once or twice to cover a surface such as the violin back presents. It must now be well soaked with water till it holds as much as possible without dripping. The violin table will now be placed with the varnished side downwards, the wetted cloth placed over it. Be sure that the surfaces of cloth and wood are in contact by gently dabbing it down all over. It can now be placed aside for about three or four hours in order that the moisture may soak into the wood for some depth. Meanwhile we may determine upon and get ready the means whereby the warping, as far as possible, if not wholly, may be got rid of. It must be borne in mind that the wood which was cut in its natural state from the tree and mostly with the grain, will be disposed, under the influence of damp, to return to the original form or condition in a more or less degree. Under good management, that is to say, with a sufficient amount of damp and no more, it almost seems to try to resume its old condition. This will be borne out by watching the effect of much wet upon any wood that has been previously bent into shape, or upon the separated ribs of a violin. The efforts of the wood to return to its original conformation will be apparent in the instance of the ribs, perhaps provoking, as the re-bending without injuring the varnish, which may happen to be of the most lustrous and delicate description, is often a matter of great difficulty, and at times an impossibility.

It was for the purpose of avoiding the risk of such defacement that the brushing away of the glue and grime by parts at a time was recommended, although the time consumed by taking the parts in detail may often be a drawback. If the ribs are quite saturated, as when left to float in water, they will be sure to come out nearly straight, and the varnish, if not of the kind that has been worked well into the wood, irrecoverably spoilt. Even when quite so, the trouble does not end here, for the wood having taken nearly its own form again, will have to be bent, with all its attendant troubles, into shape. Complete saturation of any part of the violin should therefore be avoided.

The "making" or arrangement of whatever may be needful for getting rid of the warp or twist of the back plate will now have to be decided upon. There is generally more than one way of getting over a mechanical difficulty, and in the present instance there may be many, but the one promising to be most successful and offering the least number of obstacles to success will have attention. The repairer takes in hand some of the softest wood obtainable, say American pine, or if any is easily obtainable, poplar; that kind known as "black poplar" is perhaps as free from hard thread as any, a couple or more of slabs about three or four inches wide and two or three longer than the upper and lower widths of the back, with about a quarter of an inch of thickness. An opening is bored in each, one in which the upper or smaller part will pass through, the other sufficiently large to admit the lower or larger half. The opening must of course be enough for admission of the rise or modelling and a little more. The object of this will soon be apparent. When the inner surface of the back plate has absorbed sufficient moisture from the wet cloth, this being so in the judgment of the operator, the wood will have lost very much of its resisting power to twisting by the hands. Advantage is taken of this condition, and each piece or collar of wood passed over the proper portion of the back like a loop. If fitting tolerably close, all the better; but it may

require a soft wedge or two in parts to keep it from shifting after being placed in position. In some instances more than two or even three or four pieces may be of advantage where the tendency to twist is irregular. The operator now gets a short plank of ordinary wood, of even surface, straight, and true as possible in each direction; lifting the violin table with the loops of wood attached and placing it on the plank, some of the loops will be raised up on one side while others are depressed at the same. In the case of the simple warp, one of the two will vary in rise or a different angle to the plane. The process now is simple, and the loop rising at one side will be pressed down and held in position by either a weight or any contrivance handy. It should be done a little more than seems necessary for restoring the even line of the edging, which can be fairly well seen by looking along from end to end; this is to allow of a slight recoil when the loops or wooden cramps are removed.

For a more determined twist the extra depression of one part can be accomplished by inserting layers of wood under the opposing parts so as to get more distance for the remaining one.

Nothing is now required but the drying thoroughly. This will be according to temperature and moisture present in the atmosphere; no artificial means should be resorted to.

Not the slightest injury will accrue from the process described, provided due care is taken that there is no overstraining, and the damping is neither excessive nor insufficient. The result of the former is likely to be an inequality in the bending, the line or level of the edging when looked at along its course, will look uneven, as if some upheaval had taken place here and there. Courage and caution are faculties brought to bear strongly and continuously on the subject by every repairer with a reputation for success. Without the former, many attempts which might have ended successfully have proved to be failures and to require doing over again; and insufficiency of the latter is what is so strongly

evident in a very large majority of so-called "restored" violins. The cases may have been considered by the repairers as requiring heroic treatment, overstraining, excision of an unnecessary amount of the old wood, making too much of a clean sweep of parts that may have afforded food and lodging for bore worms being too evident, besides the saving of time and trouble.

CHAPTER XII.

REMOVAL OF OLD SUPERFLUOUS GLUE BY DAMPING—REPLACING OLD END BLOCKS BY NEW ONES—TEMPORARY BEAMS AND JOISTS INSIDE FOR KEEPING RIBS, ETC., IN POSITION WHILE FRESHLY GLUED.

TO the workroom we will again return. The back has had ample time to dry while the assistant James has been doing other work of an ordinary or trifling character. The loops or collars are gently released, put aside for future use, and the now much less warped back is brought for the chief's inspection. "That will do, James, nicely, I think, now you will be able to go ahead with the other parts, and perhaps we shall be successful enough when the whole is finished to make those people, when they see it, rather regretful at their hasty disposal of the paper full of scraps of old Brescia. While we are in the bending mood, however, we will get that Lorenzo Guadagnini into a little better trim, you left it on that shelf over there last week." James fetches it, a rather woe-begone affair to an ordinary observer; it had been cut open, the head sawn off, placed inside, the upper table laid on and a string passed round the waist and tied with a loose knot. "Look at it, James, and tell me what is wrong and the remedy." The string is untied, and the parts laid on the bench and examined one by one. "In excellent preservation, sir, in most respects, although it has been opened many times and a heap of glue left about it." An inch rule is taken up and

passed over the separated parts for comparison; some slight expression of amazement passes over James's features, re-measurement ensues, and turning to his chief he remarks, "I didn't see that at first, sir, it's worse than that old Brescian; just look here, sir, the ribs are not upright, but bending inwardly; across the upper part they are so much out of the perpendicular that when the upper table is laid carefully on, instead of there being the eighth of an inch of overlapping border it is nearly a quarter of an inch each side; and what is more curious, the ribs do not seem to have been unglued since they were first put there, excepting a small part at the upper and lower ends, and see, sir, when I put the upper table on it is like an arch, and to press that part down on to the ribs will send a crack along from the sound hole on either side, which will simply be breaking up the whole affair by degrees." "Well, what method would you propose for correcting all this and making a good restoration of it, James? Give it a look over carefully and tell me." The assistant well knows the attendant circumstances connected with a good restoration or a bad one; if left as it is, it may be sold "in the trade" for so much, if badly restored it will fetch less, if well done it will be worth to the outside world a considerable sum, and if it should go well as regards the emission of its doubtless fine tone, the value as a whole would be greatly enhanced. Much thinking and careful calculation is therefore concentrated on the subject, and after awhile James says, "Well, sir, this lot of glue all round may as well come off first as last, there's no doing anything with it as it is." With this his chief agrees; so he sets to work, not with a chisel or any cutting instrument, he is so far advanced in his methodical working to know from experience that it is next to impossible to avoid injuring the sharply defined and level edge of the rib as left by the maker originally if such rough treatment as filing, chipping or cutting is resorted to; he therefore adopts a milder course of treatment. Taking a few pieces of cotton cloth or white sheeting—old calico is equally efficient—he folds them into several

layers, and when so about four inches long by about three-quarters of an inch in width. Nearly a dozen of these are got ready. After being soaked in water, they are taken out and slightly squeezed so that they no longer drip. One by one they are placed all round on the edge of the ribs close to each other so that no vacant space is perceptible between each, and after a gentle patting down with the fingers along the course they are left to do their work quietly, more effectively, too, by far, than any steel tool with the brute force necessary for ploughing through that most obstinate of materials, hard, dry glue. These folds of cotton material James calls his poultices for drawing the impurities away from the system; they, in the present instance, afford him time to think over the sort of engineering that will task his energies to some extent.

Leaving the poultices to their work, the old Brescian is again taken in hand under the direction of the chief. "Now, James, let us look over the parts again. The next step must be getting the end blocks attached to the back. We have got that into a tolerably straight line again, so that we can work on the affair almost like a new fiddle. Those old blocks, well I should like to retain them if possible, but on looking over them very little discernment is sufficient to conclude that fresh ones will be not only better but necessary. In the first place, they are very small, were roughly cut in the first instance, and since have been meddled with by would-be restorers; good new ones properly fitted will be far better than old ones added to, necessarily for strength. Some of that old pine, or as good, that French willow will suit our purpose. We will choose the latter. See that the grain runs perpendicularly or at right angles with the cut surface that is to be glued down. Chop or split it, don't saw it into shape, and then you can finish it off when glued into position, when you will not find you have to cut against the grain." This, as a matter of course, is conformed to, the blocks split off the bulk or plank, sawn to a little over the proper length or height to allow of finishing, and then

the surface to be glued is made even and squared with the part against which the ribs will be hereafter glued. The lower end one will of course require a trifle of curving to allow of the ribs following the course of the curve of the border; this the assistant duly sees to by trying it in position until it appears to be satisfactory. The parts of the blocks to be left facing the interior of the violin he leaves roughly done to shape and size of those in modern violins, that being found the best from experience since the demise of the old masters of Italy. The upper one is left more protuberant, or nearly semi-circular; the reason for this is that the strain upon both upper and lower table at this end is greater than at any other part, therefore if the block is too narrow there is not enough grip or extent of glued surface, a frequent result of which is the lowering of the fingerboard, and a buckling of the surface underneath of the upper table, a condition much to the detriment of the proper emission of the tone. Great attention should always be paid this particular part. Many repairers seem fearful that the air-space of the interior of the violin will be lessened by a projecting block. A little consideration will enable them to see that for effectiveness of purpose the form of the interior of almost any violin will not—from its curved surface—allow of an over large block with a flat glueing surface above and below.

These conditions having been seen to, the assistant with some freshly made glue paints over the surfaces of the ends that will be fastened to the lower table. As this is to be for a permanency, the glueing must be of the best. When dry, the surface is scraped even and the usual glueing and cramping done.

To Lorenzo Guadagnini again; sufficient time being allowed for the moisture in the folds of cotton to affect and be absorbed by the glue, the assistant fetches it from its enforced retirement, brings it to the light carefully, lifts up one of the poultices, touches the glue with the tip of a small knife and is satisfied. The glue has been softened and is now little more than a jelly attached to the

prominent parts of the ribs. The first thing will be to get some rag or paper, place it handy and remove one of the wet pads or poultices, then with the small knife, kept for such purposes, being blunt and worn smooth, the glue or jelly is carefully scraped away. The advantage of using the blunt knife will be evident, as it does not cut the surface as it passes over it. The point is occasionally used for any corner that may require it. After this a small sponge or rag dipped in warm water is passed over the edges and removes what is left untouched by the knife. This is repeated with each separate pad in succession all round and when completed the work is put aside and allowed to dry. A previous examination of the inside surface of the upper table had shown the necessity of similar treatment, but not to such an extent.

Not much time expires before the assistant brings the parts before his chief. "As clean almost as when new," is the exclamation of the latter; "it really wants little more than a new or proper bar and then glueing together." "Yes, but about that difference of measurement, sir, across the upper and lower parts." Here the assistant takes the upper table and places it like a lid on a box; turning it back downwards for better inspection, he says, "it's nearly a quarter of an inch out, the border overlaps frightfully, you would not glue it up like that, would you, sir?" "Certainly not," says the other, without the least sign of annoyance on his features. Turning to his man he says, "Now, James, here is a nice little instance where you can study with much interest and profit the subject of cause and effect. You drew my attention to the excellent preservation, and you have removed what appeared to you at first sight the only impediment to perfect restoration, that of the coarse glueing. You have rightly observed that the back has never been removed, and yet the ribs bend inwardly when tested and seem to require a smaller upper table. The reason is plain after you have given the matter some right consideration. The maker, as you know, was an excellent artificer and was a pupil of the great Stradivari. Now here is the

cause; the violin has been, as you know, opened several times by persons more or less unfitted for the proper performance of such an operation, fiddle tinkers I call them, and with a pot of thick dirty brown and repulsive looking glue, have with a coarse brush dabbed it all round and then screwed the lid down. The successors in this ghastly process have not had the decency to treat the instrument as worthy of much care, and so with dirty cloths and glue have again repeated the work, if it may be dignified by such a term, spoliation is perhaps a better one. Now we know that the violin has been separated and left so, being merely tied up, and been in that dirty little den of ravening wolves or tinker dealers for nobody knows how long, with the rays of the sun falling on it for many days; the result is as we see, the back has contracted and drawn the ribs in to some extent, it is glue-bound, we will set it free, the wood itself will help us, as if glad to resume its former occupation; give me that soft brush with clean water." This being handed to him, the chief with repeated and careful strokes and dippings of the brush passes over the surface, going round but leaving untouched the label, which seems to have remained undisturbed: the joint down the centre is avoided in a similar way. After some time, as the moisture has penetrated the wood, he turns to the assistant, saying, "now, James, try the front on"; this is done, and the latter, thinking he will just catch his master, says, "fits exactly now, sir! but won't it come back again beautifully as it dries." "Well, that is just what we are going to prevent, James; while this is wet, cut some soft sticks of wood and place them across from one side to the other, don't wedge them in tightly, as many as will keep up an even pressure all along." This does not take long, the sticks are inserted like so many little joists across, and the curious looking structure is once more placed aside to dry.

While James was cutting and then placing the sticks of various lengths across, his chief was close by suggesting now and then some trifling variation in the adjustment.

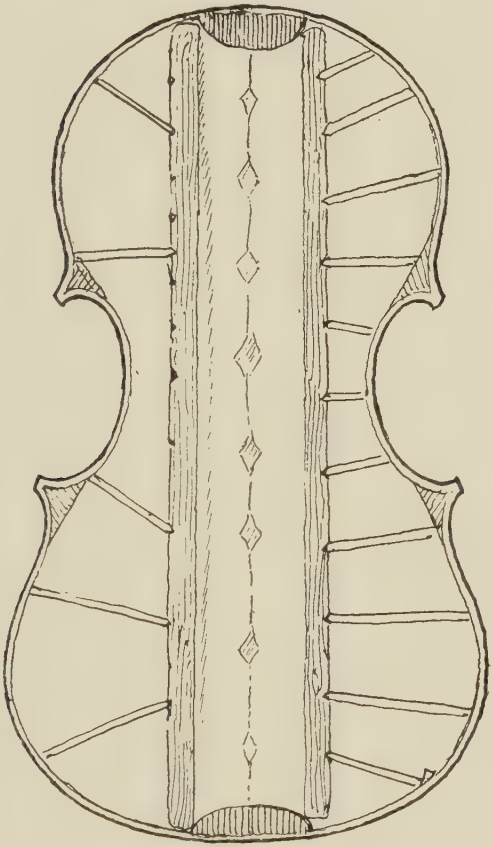


DIAGRAM 36.

"Don't put them all with the same strain, give a look now and then as you proceed, in order to ensure against an over amount of pressure—there, that will be enough! if too much against the large curves, it will bulge out too far, and the shape will go." While proceeding he was now and then cautioned as to this kind of insertion of pieces or joists. Very frequently old Italian instruments of free design are most unequal in their curves, one side having a different curving to the other; they are, indeed, seldom exactly the same on both sides, as modern makers try to make them. It will be evident, then, that care must be taken that a flat or large curve should be treated with more or less pressure than other parts. (Diag. 36.) When this inequality is very apparent, a double system of joists must be adopted thuswise, get two pieces of strong wood, say plain light mahogany, some three-quarters or an inch in thickness, and square along its course. The ends are to be cut so that they will rest within the body of the instrument easily, barely touching each end between the upper and lower linings, if at all. The two ends will touch or rest against the upper and lower end blocks and the pressure, when the sticks are placed across, will be against these, the pushing outward of parts of the ribs or linings being regulated to a nicety. Should one or more of the sticks or joists be accidentally cut too short, a small wedge of soft wood inserted at either end as may be deemed best will correct matters. As the violin at present under consideration is suffering from simple contraction and the linings are fairly stout, the joists will be arranged so as to keep up a gentle pressure on the upper ones. A very considerable amount of effective restoration can be done by means of this system of joists carried out with judgment. The two large supports,—sometimes one only may be necessary,—will be found of great use for a variety of purposes other than the one being referred to; they can be used not only for pressing against, but for the opposite, as when a rib or portion of it has from some cause—perhaps fracture or thinness—bulged outwardly. It will be perceptible at once that

for direct pressure against a part of the ribs, situated near the upper block, that the little joist will slip unless a nick is made for its reception in the large support or beam. This is so evident that a reminder seems scarcely necessary.

When it so happens that contraction must be resorted to on a rib or part, it has to be brought back; then one, two or more holes may be bored in the mahogany beam and recourse made to some bent iron wire, which, perhaps, has the preference in use over other material, as it can be shaped or pressed to a curve, one end being inserted in a hole, the other placed outside the offending part and with a soft pad or wood wedge against the old material to be brought back.

The special advantage of iron wire is that it can be gently hammered into such form as will enable just enough pressure to be exerted at any particular place as may be thought proper. This is, of course, assuming that some iron substance is at hand that will answer the purpose of an anvil. The thickness of the iron wire must depend upon the requirements and size of the work in repair, a viola of course taking stouter wire than a violin, a 'cello still more so. A useful average for violin work would be an eighth of an inch diameter. Strong wire however is not always to hand, time also is occasionally short; when so, wood must be resorted to, cutting it with a sharp knife to a form that will clasp or allow of the requisite purchase at any point; more room, however, is taken up with this method, and possibly not so much at a time will be accomplished.

A stock of soft wood in the plank should always be at hand on a repairer's premises, soft American pine of about a quarter of an inch thick being very useful for all sorts of purposes in connection with the "making," as it is termed in the business.

Supposing now that a reasonable time has elapsed for the thorough drying out of all damp, the assistant is now requested to bring both the old Italian violins for inspection by his chief. The latter gives a look over both in

turn, and says, "I think you may take those sticks out of the Guadagnini, it must be dry enough by this time." This being done, the upper tables of both are fetched and tried on, "there," says the chief, "they fit as near as we want them to, and we might almost say they cured themselves." As the Guadagnini had nothing further to be done to it, James is told to proceed with the glueing and closing up.

CHAPTER XIII.

Re-opening the Back to Correct the Badly Repaired Joint—A Few Words on Studs—Filling Up Spaces Left by Lost Splinters—Matching Wood for Large Cracks, etc.

REGARDING the glueing and closing up process, we will defer the matter for the present. While the assistant is going through the necessary routine in connection with that most important part of the repairing of a violin, the master has been looking over a few of the things that are to be operated upon some time or other. Going to a sort of store cupboard, he fetches from thence a violin in fair condition generally, but with one sad defect, the back has at one time been open, that is, the joint down the middle, either through damp affecting the glue or from violence, had parted and had been badly repaired; the two surfaces being brought together and glued, but not evenly, one side being a trifle higher than the other. "James," he calls out, "this old Pesaro fiddle is worth putting right; when you have finished what you are about, put the wet rags on this as far along the joint as may be necessary, set them better and closer, it is the fine varnish all over that will make it worth while."

James having finished the closing up of the Guadagnini and taken the instrument with its array of screw cramps into a place where it could repose uninterfered with until quite dry, returns and looks over the violin just brought forth from its retirement. "It seems to me, sir, this

back will have to come off before we can properly bring those two halves together." The other scans the work again, turns it over, tries its strength between his fingers and thumbs, and concludes with "Well, I think you are right, it is quite worth the extra labour and had better be done so." The matter being settled, James takes a seat, and, with the violin resting on his lap and held by his left hand, the broad bladed knife in his right is inserted with a carefully calculated thrust underneath the border and edging. There is not much difficulty; sometimes the violin is turned in a contrary direction when there is a disposition for the grain to tear up here and there.

At last the back is free, the corners and blocks have caused a little trouble in the progress of the knife around, the wood being hard and tough on both sides of the knife. It would have been slower work with a violin of later and more careful construction. In the present instance there are no linings to struggle with. "Now," says the workman, "we can get to work at this joint much more easily."

After being examined again by both, the rags are again brought into requisition. The back is laid varnished side downwards and a "poultice" applied as far along the joint as appears necessary. Meanwhile other work, such as fitting and finishing, is proceeded with.

A proper length of time has to elapse,—in the present instance it will be longer than that for the purpose of merely softening the glue. The damp has to work its way down at the junction of the two parts, a rather slow process at the best of times; the back now under treatment being of full average thickness causes some extra time to be taken up.

After repeated examinations, the joint, being gently tried each time, gives evidence of the glue having softened. "You must clear out that black stuff," interposes the chief, when the rag or poultice has been lifted off. James accordingly, having some warm water and a small hog-haired brush already to hand, proceeds to gently scrub the brush along the course where the ugly

black line is seen. It is necessary to do this both sides, the varnished one receiving milder attention than the other. Frequent dippings of the brush in water, gently scrubbing away the glue and wiping the brush on a cloth, working the joint backward and forward between the fingers, are details of the process gone through in a leisurely yet business-like manner ; much care is exercised that no strain is made on the good and unwetted part of the joint.

At last the old glue having by degrees been got rid of, the outer moisture is absorbed by a gentle wiping of the cloth along the course of the joint.

The next movement is simply putting the plate away to dry. To attempt any glueing together of the parts while they are swollen with moisture would be to make matters worse than before, as the edges are too soft to bear interference, besides which, the sharpness of them is difficult to perceive while wet and semi-transparent.

We will now, after the time allowed for drying, see the work proceeding under the hands of the workman. After trying the parts, that is, bringing the separated edges together for seeing whether a fresh and clean join can be effected, some soft wood at hand is cut for the combined purposes of mould and cramp. The piece used is about nine inches long by about one in width and a quarter of an inch thick. Marking off on this thickness, and a trifle over the greatest width of the back, the lower part of which is to be inserted, wood is cut away to the depth of about a quarter of an inch ; within this again a further cutting is made to fit the modelling or rise of the curve of the back. This will admit the plate loosely. On placing it within, the two halves are squeezed together by soft wood wedges of necessary size inserted between the edges of the plate and the wood cramp ; if necessary, another wedge on one side or the other of the joint is placed for bringing both to a proper level. After trying this without glue, the pieces are removed, glue of good strength is put on the surfaces to be joined and the whole put in position again. The lower end of the joint near

the purfling will require a little additional cramping together.

This part of the process is one of the very few instances where more than a couple of hands are of advantage, if not of actual necessity, the reason being that the two parts or halves of the back which have to be brought to an exact level must be held in position by two hands very firmly, while a cramp (with paper padding and cork between the teeth) is screwed rather tightly by another person. It is then as usual laid by to dry.

After a satisfactory time has elapsed, the wooden tie, mould or cramp, as we may call it, with its small wedges is removed, the metal screw cramp at the end is unfastened, the paper removed, and the joint is found to be much improved, if not quite up to the original state as when new. There is of course some superfluous glue to be cleared away, this having oozed out when the glue was first applied, there is also a portion of paper adhering where the screw cramp was attached over the border. This is done by wiping with a damp rag until it is clear, finishing with a dry one.

There is yet a little more attention necessary at times when the repairing of a back of the kind just described has been gone through. Backs of violins of a standard of excellence both high and low are not always as robust in their substance as might be desirable, so when a trifle weak there is more strain on the middle line or joint than when the wood is stout. In this case a few studs are advisable. On this detail of repairing nearly always resorted to by repairers, a few words will not be out of place. For the present we will only treat of the back. The size, disposition and shape of these is by no means an unimportant matter. At various times and places different sizes and shapes have been the fashion. Often apparently merely a matter of caprice, these strengthening discs have been used to such an extent, both in size and number, as to defeat the very object the restorer has had in view. No repairer would think it worth while to cramp or keep pressed down by any means the studs that

he may think proper to place in position. To obviate this he uses very strong glue; if a good workman he will see that the course along which the studs are to lie is quite clean, a slight washing with a brush or sponge will set this right.

Now it follows as a matter of course that the surface of the part, owing to the modelling, is somewhat concave, and so as the studs are invariably cut from a flat strip of veneer, if they are very large, the glue in hardening and of course shrinking during the process will leave a hollow space in the middle, or maybe on one side, where the drying happens to commence. There will be thus a lessening of the strengthening by the stud, and sometimes a jarring of the loose parts, giving an immense amount of trouble in finding out the obscure seat of the nuisance when the instrument may be otherwise in good order.

There should be then a distinct limit to the size of any studs that experience and judgment may dictate as indispensable. Three-eighths of an inch square may be taken as the limit to which it is safe to go.

The studs should be cut from fairly stout veneer, and for the present purpose, that of the back, usually of sycamore, the same kind of wood is preferable to any other.

They should be trimmed so as not to require much if any finishing when attached and dried, as all trimming with edged tools afterwards is likely to be attended by occasional slips of the chisel.

The glue at hand being fresh and very strong, a piece of steel wire or knitting needle of convenient length will be a desideratum, the point being stuck in slightly and only deep enough to enable the stud to be lifted thereby and held upside down while a globule of glue is laid or dropped upon it. It is then turned over and laid on the desired spot and pressed there.

If the point of the needle is nicely polished it will allow of pressing, and a turn round will release it, leaving the stud in position; if on the other hand the point is too prolonged, rough and sharp, the stud will

probably be pulled off again. It will thus be perceptible that the best shape will be rather obtuse but very smooth. When the stud is in position and the glue setting or chilling, an additional pressure with a small rod of wood or hard material will drive the glue out from the edges and the work may be left to itself.

A word or two as to shape. Sometimes circular discs of sycamore are met with, at others square. Lozenge shape is frequently met with, and this I am inclined to favour most, as there being an acute angle at each end there is a corresponding increase of holding surface with the least amount of wood. These should be cut so that the grain does not run with that of the joint, nor in exact opposition to it, but diagonally.

There is a method much to be deprecated that was fashionable in some parts of Europe in the last century, of strengthening the middle joint of the back by first cutting out a lozenge or square space and then fitting and filling with a stud. When dry, the parts are levelled and glass-papered over. This system, although looking very neat, the surface being quite smooth, will hold good for a time, but when this has elapsed with wear and damp attacking it, the supposed remedy is much worse than the disease, the whole joint being in danger of disarrangement and splitting, necessitating even further heroic treatment.

Should the studs when firm and dry seem to require a little finish, the chisel must be carefully handled with angular or sharpened surface downwards, the thinnest shavings being taken carefully off. A slight touching with glass paper may be allowed to take away the crudeness of the chisel marks.

When breakages of different degrees have to be treated at other parts of the back, small studs may be used, particularly when the fractures are fresh, free from dirt and fit well. In these instances, after the glueing together has been effected, studs of not more than a full eighth of an inch will be found sufficient. It is scarcely necessary to add that they may be thinner in substance

also. If, however, there be sufficient substance of wood, the fractures and joints brought well together and fitting closely and neatly, then studs are better dispensed with altogether, the simplicity of the whole being less impaired.

It must be always borne in mind that the smaller the amount of fresh wood introduced into an injured violin the better. In instances where a part is lost or so broken as to be little less than pulverised, there is only one course open, that of paring down the sides of the aperture so that the fresh wood may be accurately fitted to it.

The back being repaired to the chief's satisfaction, the instrument is further closely examined in order that any other damage which may be discovered shall be seen to for a time convenient for the final closing and fitting up. Just at the moment announcement is made of the arrival of a parcel directed to the chief, "With care, fragile."

"Another patient for our hospital," he observes. "Oh, it's from that professor who was here some time since. I thought from his remarks and careless manner he was a likely man to lead his violin into danger, if not into inextricable difficulties; let us see what is the matter. Open the box, James, take the fiddle out, there is probably a letter placed with it to save postage." James dutifully proceeds with the work while his chief retires to make a short note concerning some other matters.

"You're right, sir, there is a dirty envelope stuck between the strings and fingerboard." This is taken away and handed to the chief, who runs a small knife along the edge and releases the epistle, which runs as follows:—

Sir,—In this morning I have great trouble as I walk the stairs down my violin chest open itself, and my violin go to the bass, and when I was to pick him up he was bad break in one two place. I am sorry to come to you as good doctor to finish him soon, and please charge no large. Truly yours,

Hermann Groszhaar.

"Capital English for him," says the chief, to which James answers in a careless sort of undertone, "There's

a little English, but less capital about him, wanted to borrow five bob from me when he came last."

The violin, after being taken from the case, is closely examined by the chief, who turns it round about, tapping it here and there and holding it up to the light. At last, handing it to James he says:—"Not so much as I should have expected after the terrible occurrence described in the letter; the fiddle is a good one, so it deserves proper attention, no matter who owns it. Just look about the case and find if you can the small piece that has come from this place in the front table."

James looks earnestly about the interior of the violin case without success. "No sign of it here, sir, there's nothing at all but a little bit of sweetstuff," he says, taking out a small white disc from one of the side pockets.

"Well, we must proceed to work without it, so get that box out with the odd pieces of old wood; I've no doubt you will find a piece that will match the grain of the pine to a nicety; we must have the upper table off, better do it first."

This proceeding, of a kind as described before, having occupied some minutes, the upper table is held by the chief while the assistant gropes among the odds and ends of pine and in a minute or two finds a piece which is pronounced to suit admirably. "Now, James, there appears to be only this portion seriously injured, and another, almost a splinter, running along the part adjoining. It will be compulsory to cut a well-squared opening for the fitting, you will be careful to make the walls of this part contract as the descent is made, so that the wood inserted is slightly wedge-shaped. You will at the same time be careful and bear in mind that this fresh wood will have to match so nicely, that when inserted properly the threads or grain will appear continuous and not broken to the eye of any person but the experienced critic. To please this person, however, you will have not only to make the lines of the grain follow through evenly, but so fit your wood as to be in the direction of the

growth of the plank from which the table was cut. You see this aperture is on the slant or curve about midway between the bridge and part near the tail-piece. Many repairers, even when inserting fresh wood with exceeding neatness, neglect this precaution, and, in consequence, when the part is finished and varnished over, there is but little indication of repair when looked at from one standpoint, but from another or a removal of the light, this fault is very conspicuous. A frequent attempt to conceal this is made by covering the part with dull varnish that will not allow of much light passing through; sometimes an entirely opaque plastering is pasted over, obscuring the grain of the old and new wood alike in the locality, and thus making what is known as a botch."

For the execution of such repairs as these there will not be any necessity to open the violin. They will really be more conveniently effected without, there being more support and leverage where required.

A long crack while fresh will take the glue readily and be as secure as required when dry. It should be placed along the line to the extreme ends or a little over, and with gentle pressure alternately each side the glue will be gradually drawn in. This should be continued for some time, until there is little disposition shown for more absorption.

The superfluous glue will now be wiped off; should there be any tendency on one side or the other to remain higher, thus causing a ridge which must be most carefully guarded against, a piece of tape or ribbon tied round the violin at the part, and a small wedge of soft wood inserted between the tape and the elevated edge, will bring it to a proper level, when it may be put aside to dry and harden.

When sufficient time has elapsed for this according to atmospheric conditions, the binding may be removed and the surface along the crack wiped with a damp rag until only the line is apparent.

If the foregoing is done neatly and cleanly, there will be very little evidence of damage remaining. In such

instances as the present there may be occasionally necessary two, three or more bindings with proper wedges, according to the length of the crack, the size of the violin and the model. If the latter is rather high, or of the kind called by our French neighbours *bombé*, the disinclination for the edges to come evenly together without help will be much greater, and therefore binders and wedges should be at once made ready after a glance at the model.

CHAPTER XIV.

Repairing Lost Portions—Margins of Sound Holes—Matching the Grain—Fixing and Finishing Off—Replacing with Fresh Wood Large Portions of Upper Table—Lost Parts of Purfling—Restoring It with Old Stuff.

AS the repairing now under consideration is of a kind requiring not only skill, but experience in the handling of the tools and necessary appliances connected therewith, we will still suppose ourselves in the trained repairer's rooms at the rear of his premises, and that professors and amateurs frequently call at the shop in front with violins of various kinds with all sorts of injuries that they are desirous of having put right.

Just at this moment a lady of highly fashionable appearance glides in, followed by her footman carrying a violin case. She has brought a violin that has been laid aside and forgotten for a long time at a friend's house, for generations in fact, it used to be in repute as a violin by Cremona. It has been given to her daughter, who is making great progress under the guidance of one of the most eminent performers of the day, and she wishes to have it put in good playing order if it is worth the expense.

The footman obediently brings forward the case, unfastens the string that holds the lid down, the hinges being out of working condition, and places it on the

counter; the lid being raised, a strong mousy odour comes forth.

Our chief takes the violin from the hands of the man and turns it over, raises his eyebrows and remarks, "Yes, madam, the violin has been sadly neglected, the case having been left open mice have been residing in the snug retreat afforded them." "Yes," is the lady's rejoinder, "I believe the case was found a little way open, my friends have not been musical at any time and took no interest in the matter. Is it a good violin, Mr.——?"

"Good, madam? it is very fine, one of the masterpieces of Cremona. The mice have turned the sound-holes into doorways, the nibblings have gone nearly half through one of the wings."

"Wings!" says the lady. "I was not aware of there being any wings to a violin." "No, ma'am," is the answer; "wings is a technical term we use to express that slender part with the straight cut line at the lower end of the sound hole. We shall have to open the violin to repair that part properly."

"I hope that will not ruin the instrument," observes the lady. "Can you not do the repair without?" "We could, ma'am, if we wished to save time and run a risk." "Oh, please don't run any risk with it, now that I know that it is a valuable instrument I must ask you to take extra pains and do it in your best manner."

"If you would like to see the violin open, I will get my assistant to do it now, it will take but a minute or so. Here, James, open this fiddle and bring it here again."

There is not much waiting, the upper table has not been very obstinate, and James soon reappears with the loose parts, which he hands to his chief. The lady, rather eager at first to see if there is anything curious about the inside of a violin, rather shrinks away when it is brought near. "It is in a very dirty condition," the chief observes, "but we shall soon get that all right," he adds, "by giving it a wash."

"But will not wetting it spoil the tone?" the lady asks. "Not in the least, ma'am," is the reply. "In fact, it will be improved, as at present there is so much grease and filth that the vibration would be seriously interfered with. When it is quite clean there will be more freedom, and the true character of the tone declared."

The lady having departed, the chief takes the violin parts to the workroom. "This is a fine thing," he says to James.

"I thought so too, sir," he replies, "got some fine stuft on it, fiery like, nothing the matter with it but those mouse nibblings."

"That will require careful work, James, think you can do it sufficiently neat and make the new wood match well?"

"I think so, sir. Some of that old pine that we had sent us last week will match thread for thread."

"Well, give it a clean out first, James." This is at once commenced, and with the aid of some clean water, a sponge and stubby brush, followed by the application of a clean dry rag or duster, the interior presents a fairly clean appearance.

"I see you have been careful about the label, James. It was not possible to decipher it when smothered with dirt, but we can read it now. Yes, what I thought, original ticket without a doubt. Joseph filius. Bring me that bottle of benzine and the hog-hair brush." This being done, the chief takes the brush wetted with the benzine and carefully brushes about the corners and other parts where the grease has refused to come away under the ordinary treatment. Each application is followed by a wiping of the cloth held in readiness.

"There," he says at last, "it is quite fresh and wholesome. Don't suppose Mr. Mouse will go in again."

"Now, James, what do you propose doing? making a clean sweep of the ragged parts with the knife or letting in angular portions in the German manner?"

"Well, sir, on looking close at it perhaps the best way

will be to act both ways, cut that part straight through and fit the splinters along there."

"Yes," says the chief, "I think that way will save as much of the old material, if not more, than any other. Take pains with it and mind the small joinings are clean and sharp."

James retires with the upper table to his bench, where the different necessary excisions are proceeded with.

The next stage is that of glueing pieces of wood at the back of and across the sound holes. The object of this is to get more strength and leverage for pressing home the fresh wood to be inserted. From the neglect of this precaution many instruments have had cracks and other damages caused, making matters worse than before and necessitating much more work in rectifying it. After the necessary time, the glue being hard and dry enough, James begins the matching of the parts with pieces of old wood from the carefully hoarded pile in a box kept for the purpose; first one piece, then another is tried, until the right one is obtained for each requirement, both in respect of colour and matching of the thread or grain. The surfaces to come in contact and be fixed are minutely fitted, the larger ones only at present, the smaller gaps are left.

All being ready, strong glue is applied to the parts which are to be united and they are pressed together, help toward adjustment being obtained from the wood glued across.

Being left to dry, and this being complete, the cramps or wedges, as may have seemed appropriate, are removed, the cross pieces cut away and the glue washed off.

The paring down of the fresh wood to the level of the surrounding parts has now to be very carefully done. The adjacent curves must be studied and the surfaces of the fresh parts worked until by testing, not only by the sight, but passing the finger across, the surface feels as one piece.

For the small parts that require levelling, small pieces of glasspaper attached to a stick of pine shaped according to requirement will be found useful.

The fresh wood will of course be projecting some way beyond the edges or course of the line of the sound holes, the exact outline of which it is most desirous to continue.

This is about to be attended to by James, who thinks it a small matter to continue the line with his sharp knife, but his master happened to catch sight of his first strokes and sees his intention in time. "Stop!" he calls out, "not another stroke; just take a tracing of the opposite or corresponding part of the other soundhole and trace it down, don't trust to your eye unless you consider yourself an artist of experience and able to actually draw with your knife.

"You must attend to another thing besides the tracing of the contour. When you cut up to the line that you take as a guide, you must see that you make the walls of the opening at the same angle downwards, and your fresh wood in every respect of form an exact continuation of the old work."

The repair so far as the wood work is concerned is finished. It has now to receive the varnishing and touching up in detail for matching so as to arrest as little attention as possible as a repair.

"There are two fiddles, sir, that a party brought here yesterday. They seem very far gone; one of them has lost quite a quarter of the upper table, it has had a bad smash and the pieces have not been saved."

"Well, James," is the reply, "there is only one course to pursue, that is, to put a fresh piece of wood, join it as neatly as possible and match the varnish. I think we have a piece of old stuff sent us by an Italian dealer that will suit that exactly." The store of odds and ends of pine is rummaged over and the piece, with some pencil notes on it of date, etc., brought out and compared with the fractured fiddle. "Could not be better, James," says the chief. "Now take off that table, or what remains of it, and pare the ragged edges at the part near the sound hole.

"At that part you had better shave it at an angle from the upper surface and make a corresponding start on the

fresh wood; they must both fit to a nicety, and when so the old wood will overlap the fresh stuff. You will take care to have the upper surface of the fresh wood a little above the level of the old, to allow of finishing down to a good level when the time comes for the final touches."

This is all seen to, the large slice of wood is for the present left square at the top, it is thick enough to represent the appearance of the slab of wood used by the original maker before the table was cut into form. There is some gouging to be done and shaping of the parts adjoining the old wood.

It has, of course, been necessary to provide a sort of mould for fitting and pressing from above the thin shaved edge of the old material on to the new. Precaution, however, is taken to firstly glue the parts that are to be brought together at the joint. This will prevent the shaved surfaces from slipping when pressure is applied.

These parts of the process having been done and the glue dried sufficiently, the under surface is levelled all round as a continuation of the under part of the old border.

The table, therefore, can now be laid flat, and should fit well on to the ribs and linings as it did before the fracture. James now has recourse to the advice of his chief as to the best course to pursue.

"Shall I trace the other side, sir, and mark it down on the fresh wood so as to make it balance?"

"Certainly not," answers his chief, "this is what you must do. Lay the table on the ribs as if you were about to glue it down, you can let it be held in position by a couple of screw-cramps, then, with a lead pencil, take as a guide the ribs, holding it so that a mark can be made all round representing the projection of the new edging. A short piece of a pencil laid flat against the ribs and moved round, would perhaps be the most convenient."

James proceeds dutifully to work, marks the edging, and then, after removing the screw-cramps, roughly hews away the wood to near the line.

Much care and more delicate manipulation has to be

exercised now, or the precaution of the pencil line will prove to be next to useless.

Files of different degrees of tooth are employed until quite an even contour is obtained and a precise line, the continuation of the pattern, is seen.

The next proceeding will be to mark the thickness of the edging all round. For this purpose a cut line is better than a mere mark, as the cutting up to it is easier and safer. The purfling tool may be regulated and adapted in this case, after which the table will be laid flat, carefully considered, and the more detailed gouging commenced. A small pair of calipers will prove handy for measuring the depth of the channelling of the original parts and gouging down carefully until a corresponding modelling has been effected.

If the original work is sharply defined and a distinctly shaped border is present, then the work must be proceeded with as in the instance of making a new copy of a violin.

Some little difficulty may appear when the question of matching the purfling arises. The assistant opens a drawer close by, selects a likely piece, compares it with that on the violin, and then shows it to his chief, who examines it in a similar manner. "Yes," he says, "I think that is sufficiently like, in fact, it will not be possible to get nearer, it is a bit of that old stuff, is it not, that we have kept by for an emergency? Have you got the groove cleanly cut and routed out?"

"Yes, sir," is the answer; "I noticed about the depth that would be wanted at that little part where the old stuff had been snapped short at the fracture."

"Well, that will do, James. Be careful to cut the ragged end with a clean angle, doing the same with the fresh stuff—fit the parts accurately, and when you insert the purfling see that the end is pushed home so that as little as possible is seen of the junction of the two ends."

With these injunctions borne in mind, James proceeds to the work. Having had some experience in this branch of the repairing art, and, further, this being to him a

more interesting part than others of the proceedings, he at once sets to work.

Having roughly measured the length of the piece of purfling to be inserted, he finds that it will be necessary to bend it to the curves of the groove made for it. To force it in while in its present condition would not do, as it is nearly straight; for, although it has served to go round a violin in years gone by, it has almost resumed its old condition through the action of the natural damp in the atmosphere.

CHAPTER XV.

Repairs to Purfling (continued)—Filling up an Opening Extending to the Whole Length of the Violin—Fitting the Core—Fixing it in Position and Retaining it There—Finishing the Surface.

MANY old Italian violins bear indications of the haste of the maker to get the purfling done, and so without the delay of any intermediary process the purfling has been pressed in with great risk and sometimes an inevitable result of fracture.

In the present instance, the violin having all the evidence of great care having been expended on its construction and finish, the repair, to be as successful as possible, must be carried out on the same principle, every little deviation of curve being well imitated. For the bending of the purfling there may be, of course, any number of methods. According to the consistency of the material, so the management must be.

At present the piece of purfling, having been taken from a portion of an old violin bought for the purpose of breaking up and using for repairs, is very dry and rather brittle. The light coloured part or central portion is of some hard wood that refuses to accommodate itself easily to the requirements of the moment; this is found to be the case on trying a small portion with the fingers—it goes with a snap on very little attempt being made to bend it.

James having met with this kind of thing before, knows

more than one way of meeting the difficulty. As is often found, a rough and ready way is good for a small amount of work such as he has before him.

He takes a candle and lights it. He has always at hand a jar of water ready for any damping required in the number of little odd jobs constantly occurring. Placing the jar of water within easy reach, he dips the purfling into it once and then wipes it with his handy cloth.

Taking the two ends with the fingers of each hand he passes it backward and forward near the flame of the candle, using a gentle pressure to make it assume a crescent or bow shape. The heat causes the damp to evaporate and steam the materials, and the purfling will gradually assume the required curve.

When this latter happens to be short or sudden, another dip and heating may be necessary.

This being successfully accomplished, recourse is now had to the glue pot, a pointed piece of wood is dipped into it, and a small streak of glue is laid in the groove. The purfling is now carefully inserted along the course, pressed in and left to dry.

After a sufficient time has elapsed, James looks over it, and finding all things ripe for finishing, takes a gouge of a size that will suit the channelling of the particular model adopted by the maker.

Great care is necessary to shave off but a small portion as the gouge is passed along. The latter has a very keen edge, or it will tear instead of cut. It is used here and there in contrary direction, as the grain of the several parts of the purfling does not run quite level. A curved file, and finally a little glasspapering, will complete the matter so far. There will be for the finishing of the whole of the fresh wood a further process to go through, that is, a slight damping.

This can be done with a small fine grained sponge or a moderately wet camel hair brush. This is for the purpose of slightly raising the grain. If this is not done at this time the soft part of the grain may show its

automatic tendency to swell after the final process of varnishing has been gone through. When quite dry, fine glasspaper is used to reduce the surface to an almost polished level, after which some clear oil, having good drying qualities, is brushed lightly but completely over all portions of the fresh work.

It will not be absolutely necessary that this should be quite dry and hard before proceeding with the varnishing down to the tint of the old and surrounding work.

This being a separate and independent branch of the art of restoration, will be treated apart hereafter.

For the present we will be content to know that this varnishing, a very delicate process in connection with the repair, is undertaken by the chief himself, who sets to work at once and in a manner as if it were a true labour of love, there being no hurry, but careful time-ignoring attention to matching and calculation of effect. Just before settling down with colours, essences, solvents and brushes, he gives directions to his man James to "finish up the crack or fracture in that old 'Stainer' lying on the shelf there behind."

When it is taken down from its place of repose, James looks at it for a moment and then observes, "Rather an awkward job, this, sir! It is more than a crack along the whole length of the fiddle; somebody has been at it trying to mend it and made it positively worse. The edges are quite apart. You can see through in some places, and in others there is a lot of black hard glue."

The chief now has a look over the damaged part and then remarks, "The thread of the pine happens to be very straight, and that will lessen the trouble."

"Right, sir," is James's rejoinder, "not like that Genoese fiddle that we had some time back with the very curly bit of pine that looked as if the tree had been growing at the side of a rock and trying to look round the corner. Fitting a straight piece along the centre of that fiddle was no joke."

"Well, James, wash all that filthy dark glue away, and when quite dry, run a thin chisel along each side of the

hole, taking fine shavings off until the upright walls have a sharp clean edge."

The washing out is at once commenced, and when finished, the upper table, which of course had been removed some time back for ascertaining the necessary amount of repairing, is placed apart for drying.

While this is in process, another violin is taken in hand. It has a different kind of fracture, which it has been thought well for appearance sake should be re-opened and made tidy, in fact, obscured as much as present skill will allow of.

The fracture, although not one of very common occurrence, is of a kind well known to professional repairers. It has been caused by a twist, possibly while being handled by some clumsy or heavy-handed repairer of olden times, and hastily filled with polluted glue, pressed together and left to itself. It is not at right angles with the plane of the instrument, but at a very acute one, very little evidence of it, possibly none, being seen from the inside.

The first step taken by the repairer is the cleansing and removal of all foreign particles likely to interfere with the adhesion of the surfaces to be brought into contact. As there is present much grime, and this not free from a suspicion of the presence of grease, James has recourse to the bottle of benzine, into which he dips a small brush, working it backwards and forwards, wiping it on an absorbent rag and re-applying the liquid.

This does not take very long; the evaporation being rapid, the wood is soon ready for the next stage, which is that of removing the dark glue and other foul matters from the irregular surface.

This requires the application of warm water, by means of a stiffer implement, used in fact as a small scrubbing brush; the moisture between whiles is pressed in and out by the fingers with repeated wipings and re-wettings.

After a while, being satisfied that the surfaces of the fracture are clean to the desired degree, James allows the wood to partially dry. In the meanwhile, he cuts a

couple of pieces of wood to fit the back and front of the table, so that with folded paper as a pad the parts may be pressed together. All being in readiness, fresh strong glue is inserted all along the opening, the repeated pressing being kept up until he is sure that the glue has penetrated every part. The superfluous glue oozing from the inside, after a slight squeeze along the course, is lightly wiped off, the moulds applied back and front, and the cramps fixed.

Other little odds and ends of repairing have occupied the attention of the assistant during the time of waiting for the drying of the before-mentioned upper table of the Stainer. This latter being of full model, although not resembling the swollen or bolster-like form of many imitations of the master, requires special attention with regard to fitting in of the fresh wood or core.

The fresh wood must not be bent, or the matching of the grain with the old material will be impossible, and the repair when completed will be strikingly conspicuous. It must therefore be inserted in such a manner that when pared down, the direction or flow of the grain will exactly coincide in all respects with the rest of the table. The fact must be recognised that although the threads may be perfectly straight from end to end, yet they may rise higher at one end than the other or not run level with the plane of the table. (Diagram 37.)

This being duly calculated by James when cutting the piece that is to be inserted as a core, the table with its opening extending nearly from end to end is placed on an even surface facing upwards, as when on the instrument. The core is then tried in the aperture. Perhaps a thin shaving or two is found necessary, when finally it is sufficiently exact. The next stage is that of getting ready the means of holding or pressing all the parts together till dry after glueing. Taking a flat piece of wood, perhaps the one just used, and placing the table down, a pencil line is traced on the board round the violin table as if for the purpose of copying the pattern. Two straight lines are now ruled on each side touching

DIAGRAM 37, showing half length of core inserted before being pared down, and with grain.

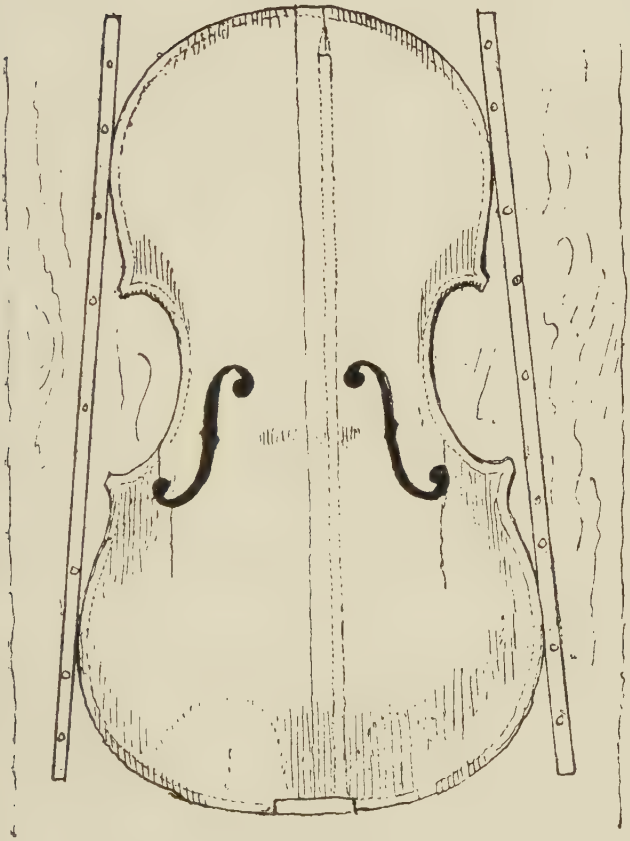


Diagram 38.

the most projecting part of the upper and lower curve (Diagram 38.)

On the outside of each line, but touching it, a strip of wood about a quarter of an inch square is pegged or nailed down.

The table or plate when placed flat between these two small bars of wood, is within an acute angle, and can be held tight or not according to the degree of pressure with which it is pushed toward the smaller end.

It will at once be perceptible that a trifling pressure forward of the table towards the small end will result in the raising of the central part and the widening of the opening instead of closing it.

There must be, therefore, some means adopted to counteract this, and these are not difficult to fix upon. In lieu of pressing the table forward with risk of damaging the part of the border that will come in contact with the two fixed bars, it will be carefully tried as to fitting the exact position it is to take when glued, that is, sufficiently forward in the space between the bars that will only admit the table with a slight rise in the arching, the joint or part holding the core being in a more open condition as a consequence.

The exact place or point of contact is marked with a soft pencil or piece of chalk on border and bar. The table being taken away, the parts requiring it will be carefully glued.

Placed in position again, necessary means are taken that the surface or plane on each side of the core are quite level with each other; if they are not so, they will, after the necessary paring down of the core has been completed, cause an ugly, uneven appearance. To prevent this, therefore, the parts must be adjusted by the application of the fingers on one side or the other, or gently tapped by a piece of wood sufficiently heavy until exactness of level is made sure.

There is now necessary a weight to be applied along the whole length of the junction for keeping all in position until the glue is quite dry and hard.

Any kind of weight may be applied, the smaller and heavier in proportion to size the better, as so much more can be seen when several are used instead of one and that of larger dimensions.

These being placed in position, the table with its adjusted weights is placed away for drying.

When time has elapsed for this to be satisfactorily accomplished the table is taken in hand again, the weights lifted off and a slight tap at the upper with a piece of soft wood will set it free.

The part of the core now rising above the upper or varnished side of the table is pared down very gently, care being taken that the chisel does not work into the varnish on either side of the core, and that it is not driven against the grain, as by so doing the wood is nearly certain to be torn instead of cleanly shaven.

A close examination of the surface is now made, if found quite satisfactory, it may receive its final polishing by the application of some very fine glass paper wrapped round a piece of cork, with a little clear oil dabbed on it. This will give a dead smooth surface. If the above directions are carried out with clean and sharp work, the line along the table marked by the presence of the core will be so slight as to appear little more than the thread of the wood, in the highest class of repairing it will be nearly exact.

The part of the core projecting on the under side of the table is easily disposed of by a gouge in the same manner as described for the action of the chisel on the front.

The operations just described are of a kind that should not be undertaken without considerable experience, as, indeed, ought to be the case with many other repairs, the requisite dexterity of handling not coming at once even with much natural ability.

CHAPTER XVI.

Repairing Undertaken by People in Business not Connected with that of Bowed Instruments—Removal of a Fixed Sound Post—Fitting a Fresh Part of Worm-Eaten Rib—Bringing Together the Loosened Joint of the Back Without Opening the Violin.

WE will now move down to the front portion of the premises again, where the chief has been pondering over some instruments with damages of different kinds and degrees. Some have been sent for repair, but have nothing apparently wrong about them. The little note sent with them is simply to the effect that "they do not go well" and the owners would like them put in order. A tap is given here and there with his knuckles, and this kind of test is sufficient in one instance to get an acknowledgment from the violin itself that its ribs do not adhere to the back as they should. Another betrays no looseness anywhere, and there is no fracture perceptible on a close examination; this is put aside so that it may be strung up properly, when it will probably give out some distinct evidence of internal wrong, if not of some external injury, which being fresh and clean is not easily affected by mere tapping.

In the midst of his meditations over the different possibilities, a gentleman enters accompanied by a young lady, probably his daughter, who carries a violin case. He enters upon his subject at once, saying:—"I have

brought a violin for your inspection, it was left behind by a friend who went abroad some time back and he lately wrote over saying that my daughter might find it useful, as he had been told by his father that it was at one time an instrument with excellent sounding qualities. He is not a player and he kept it shut up for a long time and seemingly forgot all about it. We of course soon got the case from its hiding place, opened it and took the violin out. My daughter here found two strings had snapped and put on others. When she tried it with her bow, however, most unpleasant sounds came out. My daughter proposed that it should be taken to a shop in our neighbourhood where she gets her music; she says they are very nice people, and so she took it there and they told her 'it would be put in order by the next morning,' which of course seemed very prompt. My daughter has tried it since it came home, but it seems to have even less sound than before."

"Let me have a look at it, please," says our chief. The violin is at once taken out of the case by the young lady and handed to him. The chief looks over it, turns it about once or twice, and asks: "Did you put this into the hands of a repairer who professed any knowledge of violins?" The answer is—"Well, the people that my daughter took it to said they had intrusted the violin to their best pianoforte repairer, who had worked in one of the principal manufactories in London." The chief observes: "A piano is very different to a violin, sir; the repairer of one has to deal with curved surfaces, and wood of two kinds only, the other with flat ones and other woods and metals." "I hope the treatment has not ruined the instrument, can it be restored, will it be of much value?" says the gentleman. "Well, it is not of much value as a musical instrument in its present condition, but when properly restored would command a considerable price. The restoration will cost some pounds and be a fairly good investment."

"You had better do it and to your best ability," answers the gentleman, "and please send it home when done."

The two visitors make their departure and then James is called for a moment by his chief, "Hi! James, just look at this bit of repairing."

The assistant takes the violin in his hands, looks over it and laughs. "Not trained properly, sir, at mending; what a plaster it has got underneath the bridge! and there's a large one underneath the post too; there's strength there if nothing else."

"Well, James, we must get both of those out and put something in more to the purpose, the gentleman wants it done well and we must make it sound properly to please him and his daughter. From the manner in which those patches are inserted and their thickness—they are stouter than the tables themselves—there would be very little tone. Well I never! they've glued the sound post in."

This discovery caused a good laugh from both. "We must have the upper table off at once, James," continued the chief. "But how about the post, sir?" interposes his assistant; "it looks as if it will hold on tight." "Well, you must take a fine chisel and work it in two before you commence the opening."

James retires to his corner, and taking up a small chisel stuck in a short handle of his own fitting, he inserts it carefully through the right sound-hole, chipping the post gradually down one side, then turning the violin round on the cushion, he works away at the post through the other, and although from the extra distance from this, the chisel has a weaker hold, there is less substance to work through, the greater part having been worked away at the first attack.

The way is now clear for removing the upper table, which James does after some trouble in working his knife along between the edging and the upper part of the ribs, in consequence of the glueing having been done with a bountiful hand, and the parts pressed together tightly, so much so as to show very distinctly where the screw cramps had been wound up.

The exposed interior is brought before the gaze of the chief, who looks at it for a while, then remarks, "Very

bad, but I have seen the like often before, and suppose will do so many times again.

"Give it a cleaning, James, they've fastened the plaster on to the dirty wood, and I expect the hold is very slight if at all in parts."

"No, sir, I tapped it about, and found some hollow spaces that would admit my small knife; the plaster had not been cut evenly, and then not pressed equally all over. The back seems about as bad, although it being thick does not need any support."

"No, James, the repairers, if we may give them such an honourable title, wanted to show that something had been done for the money charged. Give the interior a clean out with warm water and sponge, leave some wet rags over those plasters, and when the damp has soaked through, you can soon get your gouge underneath and pull them off, washing the surfaces afterwards."

This having been done as requested, the two parts are again brought before the chief, who forthwith takes a pair of calipers; these he applies carefully to both upper and lower tables in turn, moving them over in all directions. "I declare, James," he then observes, "there is no necessity for any patches or plasters anywhere; there is a very weak upper rib that has been so knocked about by several mendings, and spoilt inside and out, besides being riddled by insects, that we must make or fix a fresh piece in its place. Now, this fiddle being worth the trouble, you must see if you can make the repair so neat as to be almost invisible even when closely examined."

"Well, sir, I'll try at it," is the reply, this being a kind of repair that James will take much pleasure in, to show his dexterity of handling and clean cutting.

The first thing is to hunt among some pieces of old ribs for a part that will match well. This takes some time. At last an old rib is found that appears just the thing—a part of it only will be required.

The next requisite is a mould or piece of wood cut exactly to the curve of the inside of the rib; this must not be roughly done, or any idea of "near enough" being

thought of; if it does not fit exactly, then the pressure to come against it will be unequal in parts. If cut from a little block of soft wood the cutting will not take long, and the trouble be amply repaid by the result.

An exterior mould will be as necessary as an interior, and if the original rib is of fairly equal substance, the two moulds may be tried one against the other, and should fit nicely.

The ragged openings and rotten part of the original rib having been carefully examined with regard to the size of the fresh piece to be inserted, a line is marked by soft chalk as to the position and extent to be covered by the fresh wood. The aperture to admit the fresh piece of rib must be determined upon exactly, and be cut with the utmost neatness. Before doing this, however, the question must be gone into, and settled definitely, as to whether the fresh piece is to be pressed on from the outside or from the inside.

The choice must be in favour of the more convenient, or that which will be most likely to lead to the best results. As the sides of the aperture taken longitudinally must be cut at an acute angle and not upright, the convenience of cutting the edges of the opening from the outside will be decidedly better and more handy for obtaining the desirable sharpness of edge.

As a matter of course, the piece must be tried on again and again until it is clearly a good fit all round. When in a satisfactory state it will, when tried finally, be elevated a trifle above the surrounding wood.

The angle at which the upper and lower portions fit has no need to be cut so acutely as at the ends.

Everything being ready, including some strong clean glue, this latter will require painting over the surfaces that are to be closed together until absorption has ceased, and not before this are the parts to be brought home, or the absorption or soaking into the wood will continue, leaving no glue for holding the two surfaces.

When quite ready, the interior block of wood or mould will be held in position by the hand.

As usual, the piece of paper on the face of the mould will be used for preventing the glue holding on to it. The piece of fresh rib is now placed in position, and the outer mould (faced with paper, of course), applied. The screw cramps are now affixed, tightly wound up, and left for drying.

After ascertaining that all the glued parts are perfectly dry and therefore hard, the cramps, moulds and paper may be removed. If any paper should be found adhering a moistened rag will easily remove it.

The next proceeding will be that of levelling down and removing any unevenness, on the outside especially. If the fitting has been very accurately effected there will not remain much to do in this line. For the inside a piece of glass-paper folded over a curved block of wood, or the actual mould that has been in use, will serve the purpose if not too large. This can be rubbed backward and forward till the surface is level. For the outside a slightly different treatment will be preferable, that is, a portion of glass-paper of the finest grain placed as before in front of a block of wood. There is no necessity for it being a very close fit so long as it is even in surface.

This should have some oil of a drying nature put on the surface, a little dabbed on with the tip of the finger will be enough.

A fine surface, after a little passing backward and forward over it, adding a little oil now and then, will be obtained.

The advantage of the use of oil is, firstly, the ease in use and the smoothness of the surface and absence of harshness, secondly, as it will have penetrated the wood to some extent it will prevent the varnish, that eventually will have to be applied, from sinking into the pores.

Many otherwise excellent repairs have been spoilt from the neglect of this simple precaution; without it, the glass-paper leaves a dry, finely torn or raw surface which absorbs very readily the coloured varnish that will, in sinking, look much more intense, uneven and totally unlike the surrounding old varnish, which, it is most desirable, should be as closely as possible imitated.

All these particulars, rules, and precautions, having been carefully attended to by James, the instrument is at last brought by him in as advanced a state as possible to his master, the latter always reserving to himself the final touches or finishing and regulating.

About this time another caller, an amateur in a state of great excitement, brings a violin case hurriedly in, and coming up to the chief without any ceremony, says, while undoing the buckle of the straps binding the leather covering: "Oh, my favourite violin is ruined, its back is broken, and I feel sure you can't do it up; it is a Venetian Montagnana that I have had so many years, and that you—yes, even you—admired. You don't say much as a rule in favour of anything I bring you, but you said this was the only good thing I had about me; it is past your power to put right again, I am afraid." "Then why did you bring it to me," says the chief, "if it is impossible for me to remedy the breakage? let me see it."

The case having been nervously opened by the owner, the violin, after a glance, is lifted out by the chief, the owner looking on in a state of great perturbation. "Please be very careful," he says, as the practised hand of the master turns it about, looks at it here and there, over one way and then the other. "Why, its back is not broken; where is the fracture?"—"Don't you see, all the way down, it is quite loose and open?"

Another turn round or so, and the chief exclaims, "Oh, you mean the joint of the back is open—that is not broken; I did not see it at first as the light was going in the same direction; we can put that right again for you."—"Here, James!" he calls out, "just look at this; is it past our mending?" James casts his eye over it for a second or two, and says, "No sir, I've done up that kind o' thing over and over again." Then, turning to the owner, "Two against one, you see."

The amateur looks at the instrument with great earnestness for a moment or two, then observes: "You will have, I suppose, to take it all to pieces to do that kind of repair, eh?"

"Oh no," replied the chief, "we shall close that up without undoing any part of it except taking the strings and sound-post away." At this moment he has inserted the post-setter and pushed the post a little, which proceeding causes the back to open wider, the mouth of the owner opening widely also, accompanied by an increase in the general appearance of anguish.

"There now," says the repairer, "just that little extra pressure from the sound-post enables us to see how far the opening extends; it is not all the way along, and there does not appear to be anything to prevent it coming together evenly again."

The chief now dexterously, with the point of the "setter," takes the sound-post out, the owner looking on with some amount of astonishment.

"You call in the day after to-morrow, sir, and I hope you will find it as right as ever."

These words have a cheering effect on the owner. "You are sure that will not be too soon," he observes. "Oh no," replies the other, "we shall put three or four studs along the centre, inside, and that will prevent it going again."

"But how," rejoins the owner, "are you going to put studs along the joint inside without opening the instrument?"—he was getting interested.

"Well, you leave that to us, sir, and we will tell you afterwards." This was said in consequence of a fear that the amateur would be using the time of the establishment, and as a result the amateur and owner walked away satisfied.

CHAPTER XVII.

INSERTION OF STUDS ALONG THE JOINT INSIDE WITHOUT OPENING THE VIOLIN—LINING OR VENEERING A THIN BACK.

AT the appointed time, not any earlier, the amateur makes his appearance, inquiring somewhat anxiously as to whether the violin was finished, or more precisely speaking from fear, whether the repairer had succeeded in restoring the instrument to playing order? "Oh, yes," is the response, "and goes better than it could have done for some time back. You see its complaint has been coming on for some time, beginning with a slight opening at the lower part, and continuous playing with the strain of tuning up now and then extended it, until the time when it became of such magnitude that you could not help observing it. Being gradual in its progress, the tone getting worse by gentle degrees, was also unobserved by you."

On this, the violin being handed to its owner, a close examination is made all over the outside, and through the soundholes.

"Well, really," the owner at last breaks out with, "it is most beautifully done! I should not have thought it possible, and however did you manage to get all those little squares of wood ranged in a line inside, and you said you would do it without breaking open the violin, and—tell me how it was done!"

"Then I will keep my promise if you have patience. It is not a very difficult matter to those used to such

things; you see the first thing was to get the outer part clear of any impurities that would prevent the glue from getting a tight hold of the surfaces that are to be held in contact; the next, to work some strong glue along the course of the joint, this by gentle and regular pressure alternately each side of the line, is gradually drawn in, the whole length is then wiped with a cloth and pressure applied to keep the joint closed, and the whole allowed to dry. When so, the interior is attended to, a clean damp brush, small enough to pass down either of the sound-holes, is worked backwards for a short time along the joint, just enough to remove the slight accumulation of dust and prepare the wood for the reception of glue. Then the little squares of sycamore being ready, are pricked in the centre with this pointed iron wire, and taken up one by one; on each occasion a globule of strong glue is dropped on the under surface.

"The wire with its attachment of stud and globule is carefully passed down through the soundhole, which one must depend much on circumstances and light available, being cautiously lowered until the little square of wood is exactly over the joint and gently pressed down on to it.

"Care is taken, of course, to place it on the exact spot; if not accurately in position, a slight push with the same wire or another or greater strength is given, and then a little more pressure on the top.

"When this is done, others are inserted in the same way, and as far along the joint as can be reached with the wires. After having dried, the glue which had oozed up round the square will be found to have decreased so much as to be but little perceptible—thus you see how it was done. Do not try this yourself unless you have become expert by long practice in repairing generally, as you may probably find this more taxing to your nerves than you may be aware of, besides finding it a difficult and dirty job getting any mislaid pieces out again."

This last piece of friendly advice is quite to the taste of the amateur, who, being a non-practical man, is wise in abstaining from meddling in directions for which he has

no natural bent, and unlike the numerous tribe of would-be repairers who think that any person who can use glue and cut a piece of wood can engage in the restoration of such a small instrument as a violin.

Our amateur, when arrived home, naturally enough shows his restored violin to his friends, one of whom has been looking at it for some time, and at last says: "That's the repairer for me, where does he live? My violin is sadly in want of proper attention, and I think it requires stronger measures for its cure than yours."

The address is readily given, and the instrument duly taken round to our chief and his assistant. The statement having been made as to recommendation, after an inspection of the very nice restoration of his friend's violin, the new-comer takes out his violin from its case and places it before the chief, who turns it over and over, looking at each fraction of an inch without seeing much the matter with it.

The owner at last breaks in with the remark that a violin maker residing where he lately came from had told him that the instrument would never go properly unless the back was re-lined—that was perhaps the term used.

The chief then rejoins: "I think the repairer was very likely hitting the mark when he said that; this is one of those old violins of the Brescian school, which are often too thin in the back for modern usage, and there is no other resource but that of lining—or veneering, some would call it—the back. If you like I will open it, and ascertain whether it is so with this instrument."

Consent is given, and the chief goes to the back of his premises, and returns with a much-worn table knife. Sitting calmly down before the new arrival, and resting the instrument face downwards on his lap, he proceeds with sundry slow but strong thrusts of the knife round the junction of the ribs with the upper table; the cracking sounds emitted as the knife gradually works its way along are rather trying to the owner, who, however, has confidence in the reputation of the master-hand at the kind of work. After a little extra pushing here and

there, and lifting gently to ascertain whether the parting is complete, the upper table is at last lifted quite clear of the rest.

The owner at once asks, "Is the back in a very bad state?" "Well," is the reply, "it is in such a dirty condition that it is not possible to tell.—Here, James, bring me that water and sponge!" These being at once brought, with a cloth in addition, the chief at once begins bathing the inside, giving a heavier rub in different parts, as some appearances suggest the extra treatment.

At last, after some few minutes of this application, the cloth is applied, and the interior assumes a cleaner aspect.

"Never being cleaned out since it was made, I should think," is the observation, "excepting once," he adds, as his practised eye lights on a small, but thick stud resting over a small crack at one side, "and that was a very long time ago, possibly a hundred and fifty years." "Does it require the 'lining'—I think that is what it was called?" "Yes, it will be so much better for it, almost necessary."

The owner soon after departs, and the chief and his assistant proceed to work upon the violin. In general condition it happens to be very good, the one opening referred to being the time at which the modern bar had been attached in place of the very old and small-sized one. The fingerboard being old is easily removed by a sudden pull or jerk. After further cleaning with the aid of a hog-hair brush, this being adapted for getting more completely into the corners, both parts of the violin —they have both had a cleaning and looks more wholesome—are placed aside to dry.

When this has taken place to the satisfaction of both master and man, the back is rubbed over with an oiled rag, the object of this being to prevent the mould now to be taken from sticking to it.

Some good plaster of Paris is mixed, and a sufficient quantity placed on it till a coating an inch and a half in thickness is produced; this amount is necessary owing to the tendency to get out of form or warp if too thin, failures having often resulted therefrom.

When well hardened, this mould is lifted off; it comes away easily, showing a perfect facsimile in reverse of the back of the violin. This is carefully wiped, and any small specks of plaster that may be adhering are picked off.

The mould has now to be dried, as it would otherwise —from the large amount of moisture within it—undo the back, or any cracks that may have been glued up.

Placing in a moderately warm oven is as good a method as any, the natural drying by open air, even in sunny weather, being a long process.

After being tested and found to contain no moisture whatever, the mould is placed upon a bench, and the surface which has been in contact with the curved form of the back receives a slight oiling with a brush. This will prevent as much as possible injury to the varnished surface of the violin when placed in it. This may be further helped by a sheet of soft paper or soft cotton being placed between, when the back of the violin is laid in the mould.

Before proceeding further, there will necessarily be the preparations made in connection with the piece of veneer that is to be glued to the back.

In order that this may be as equally as possible pressed into the shape, there must be another mould made; this will be of some soft wood that will cut easily into shape, and be made to fit as near as can be to the back.

Next a layer or portion of cork about one-eighth of an inch thick, and large enough to cover the whole of the veneer, will be required. Some repairers would prefer india rubber or other yielding substances, which will fit into any unevenness while sustaining great pressure. This last will be caused by the press or large cramp, which must be very strong.

All the foregoing being ready to hand, the veneer being cut down to the amount required, perhaps to a pencilled line marked on it for width and length, it will be wetted; being of slight substance, it will soon absorb sufficient moisture to remain damp during and over the time the other preparations are made.

All being in readiness, the back being laid down accurately in its bed of hard plaster of Paris, the cloth or paper having been placed between, the cleansed and dried surface of the table is brushed over with the strong glue which, if the apartment is of sufficiently high temperature, will not coagulate or set, but give time for the brushing of glue on one side of the veneer. This is at once placed in position on the glued surface of the violin table; it is then covered with some thin, soft paper, the cake of cork or india rubber being laid over it. More carefully than all, the carved piece of wood that is to be pressed down must be exactly in its right place, and above this, other slices, so that the pressure may be distributed well, and not merely on one spot.

For this a goodly pile will be of advantage; to be quite scientific in its proportion, an imaginary line drawn from the central point of the pressure above to the outside or margin of the field of pressure at the lowest part, should not be at more than an angle of forty-five degrees.

Attention being paid to the foregoing, and the press or large screw cramp being already in position, the pressure, which must be great, is applied.

The glue will be seen oozing out between the surfaces of the table and its veneer; this can be wiped off easily, and save the trouble of removal when dry and hard.

Necessarily, a longer time will be consumed in thorough drying and hardening in a case like this than in an ordinary repair in which the atmosphere can more readily obtain access. When quite ready, the pressure and the pieces of wood, paper, cork, or indiarubber can be one by one released, and the simple veneer, now firmly attached to the lower table of the violin, can have its edges trimmed round with gouge, chisel, or scraper, and finally glass-papered to a good finish.

When neatly done, the edging of the veneer will decline gradually in thickness, and die off all round.

There is nothing further to be done now, but seeing that the bar is right in proportion, position, and fitting.

CHAPTER XVIII.

THE BAR IN OLDEN TIMES—THE MODERN ONE—THE OPERATION OF FITTING AND FIXING THE BAR—CLOSING AND COMPLETION OF THE REPAIRS—VARNISHING OF THE REPAIRED PARTS HAVING FRESH WOOD.

MUCH false reasoning upon insufficient premises has at times on and off been bestowed upon the subject of the bar and its supposed mysteries. Space at command will not allow of a dissertation on this detail of the constitution of the violin. A few remarks will perhaps be sufficient for present purposes. When violins were first sent forth by their inventor, Gasparo da Salo, the bar was sometimes omitted, possibly in all the earliest ones, the strain on the upper table being then slight as compared with that of the present day—at others it was very short and weak. The substance of the upper table was considerable, and much over that which the later and modern makers approve of, and thus there was a counter-balance.

At the present time still stronger bars are inserted, and very frequently without rule or reason. Occasionally a coarse bar will allow of good results as regards the emission of the tone, the length and thickness happening to be suitable to the proportions in detail of the instrument. A weakness at each end of the bar is an oft-recurring cause of bad going with regard to the vibrations.

From this we may infer that when the bar was first thought of and inserted it was simply with an idea of

supporting the part over which the third and fourth strings were stretched, and that as the tension of the strings became greater in consequence of the rise in the pitch, so the bar had to be increased in strength, that is, longer and deeper. The discovery or unearthing of an old master in its original condition will therefore be followed by the opening and re-barring for the emission of the tone according to modern ideas; these may be summed up as the getting of the largest amount of tone accompanied by freedom of vibration or ring.

As the removal of a defective or weakly bar and its renewal and fixing in accordance with the best knowledge of the subject is an operation that should be seldom attempted by other than an experienced professional repairer, it may be as well to pay another visit to our chief and his assistant, James.

After some lapse of time we find on looking in at the establishment that there is no perceptible change in the working or general routine; violins innumerable have come and gone and still seem likely to do so for ever.

The chief has been occupying a few minutes looking through a newspaper, not so much in connection with his business, which, as no doubt will have long since been perceived, is a private or personal one, he is simply keeping up with the times in reading about what is going on outside his own little world.

James, notwithstanding his lesser amount of artistic and scientific knowledge than the chief, has been steadily improving in his own way, that of implicitly following directions put forward for his guidance and given with so many axioms, the result of long experience and watchfulness. It is a warm day and really heavy work would not be to the disposition of either master or man.

Looking through the doorway into the workshop at the back, James can be seen sitting as quietly and contentedly as his master in the front. He is engaged on some fitting of small pieces into some fractures of the upper table of a Stradivari. Having been told to do them neatly, cleanly and with every precaution, experience and

deft handling of tools, he has got these latter into nice cutting order. The finest and even semi-transparent shavings will have to come from the fractures and the portions of wood to be inserted therein. James has by this time acquired considerable neatness in the treatment of "delicate jobs," as he calls such as the present. His tools have had special attention in the keenness of their edge and he thinks that when all is finished the violin will be as good as new, and very little of the damage done while in charge of the owner will be perceptible unless hunted for. He argues within himself that the greatest amount of expenditure of muscle work and fitting together of ever so many parts has been done by himself, and therefore the honour ought to be principally his, in fact the fiddle is more of his make than that of old Strad. His ruminations are stopped rather suddenly by the voice of the chief, who calls out, "I say, James, what about the re-barring of the Maggini that Miss Winks left a week back?"

"Well, sir, she called again yesterday, and said she didn't think it would be done, because we seemed slow people, but intended to call again in three days."

"Perhaps you had better set to work, James. Have you got everything ready for placing the bar?"

"Yes, sir, everything except the bar itself, which is not cut to shape yet."

"Well, let me see it. Is it of nice straight grain and from the stock of that old Italian?"

"Yes, I've picked out a piece that appears to me just the thing; it only wants the curve cutting to fit the upper table, and that is quite clean and regular without any slips of the tool in cutting the old one out, which I think was the original one."

The chief gives two or three glances over the work, his accustomed eye being ready to catch any little fault likely to have been made by his man.

"That surface, James, for a Maggini, is remarkably even; as often as not the gouge marks are left, making a close fit of the bar an impossibility, let me see the bar."

The piece of wood is produced; the Maggini being a full fourteen inches in length of body, the proposed bar is cut to ten and a half inches in length and seems to the chief to be satisfactory.

"You can now go on, James; let me see the bar before you glue it in."

The upper table of the Maggini and the bar are taken away by James, who goes at once to work with the necessary preparation for placing the bar in position correctly.

With a rather soft lead pencil he marks off the length from each end of the table that the bar will occupy, that is, a little over at the lower end than the upper, the exact distance from the joint or central line, a trifle, perhaps eighth of an inch nearer at the upper part, letting the middle or thickest part of the bar be at the spot where the foot of the bridge will rest.

After this the bar, at present straight and about three-quarters of an inch high all along its course, has marked upon the part that has to remain uppermost some indication to the fancy of the operator that will keep in mind which end is to be placed at the upper part.

This being done, he commences with a chisel to cut away portions at each end, and tries on the surface of the part to be fitted to. After two or three times the chiselling has to be more finely done until the closest fit possible is obtained; it is then ready for fixing. The bar is as yet quite straight along the upper part. With regard to the levelling of the bar to the curve of the interior part of the upper table, there used to be a custom in the repairing business of "putting the bar in with a spring" as it was termed. The repairers always spoke of it as "the regular thing to do," but on being asked questions as to how much and under what circumstances the "spring" would be best one way or the other, became somewhat reticent, possibly from fear of being led into some scientific depths from which it might not be easy to extricate themselves. James, however, has been taught differently in the management of this portion of his work; he having found

from close examination that the rise of the curving on the outside on the bar side was quite high enough, went on with the operation.

Had the bar side been in a sunken condition, his chief would have required him to restore the elevation by the wetting process before alluded to.

The accessories, glue and cramps being in readiness, two pieces of thick hard brown paper are folded together to go over the varnished surface of the upper table. This will be quite thick enough, as any more will cause a liability to press the bar into the wood when under the influence of the damp of the glue. This result is often seen in violins that have been through the hands of inexperienced repairers, there being an elevation at each end where the bar terminates when the violin has been strung up.

Cramps are used of sufficient width for reaching over the border at each end and quite on to the end of the bar. James, after his repeated trials as to the closeness of the relation of the curve of the bar to that of the table, takes it to the chief as commanded, who expresses his satisfaction and orders the completing process to be gone through.

The curved surface of the bar is wetted and some glue placed along, the part of the table with which it is to be in contact is also wetted, but not much. After a few minutes for the glue to soak in, the final glueing is done along the course on the table and the curved course of the bar; the latter is then placed in position and first one cramp at one end is fixed, then the other; the screwing down is very gently done, James, from experience, knowing just how much and no more. The hard brown paper between the cramps and their padded or corked ends prevents any injury to the varnish.

For the central and adjacent portions of the bar to be pressed, James uses at times wooden cramps with a longer reach, and treating all parts of the bar with gentle but sufficient pressure, being meanwhile careful that the pressure is not directed on one side but direct downwards;

he knows that if this is not strictly attended to, the bar will be twisted and when dry, or even finished, will not appear straight but curved along its course.

James having seen that this part of the operation has proceeded satisfactorily, places the table away to dry, and when so, the cramps are removed and the table examined by the chief. All being assumed to be satisfactory, James is told to go on with the shaping down of the bar, which is done with a chisel held with the bevel downwards, this being safer and less likely to slip.

This having been done to the curving desired by the chief, the glass-papering to a nice even surface and finish is proceeded with, and the operation may be said to be completed.

We now come to the closing down of the upper table. This last is a final process that when done clumsily, hurriedly, or in many ways improperly, has been the cause of much damage, if not positive destruction, to many good or valuable works of the great masters and others.

Before deciding upon the precise moment for this important stage of repairing, there should be a most careful investigation of the condition of the whole of the interior of the instrument.

Without this there is the possibility of fine splinters of wood, or cracks, being left unattended to that may announce themselves when all is supposed to be in readiness for the bow, by a jarring, or, when the bow is applied, by a buzzing which will take all the knowledge, experience and guessing, perhaps more, that can be brought to bear upon the matter without any practical result, excepting perhaps that of the necessity of re-opening.

If found out before closing down, neighbouring parts should be rigidly examined, as a slight, almost invisible fracture, will, on testing, be frequently found to be much more extensive than was at first suspected.

Gentle tappings may be tried and testings of resistance to bending at the same, keeping the light at right

angles to enable the slightest opening or fracture to show itself and be at once placed under treatment. When every test proves the instrument to be sound and ready for closing up, preparations may be commenced.

There is probably no one of the different details of repairing that gives more evidence than this of the kind of workman engaged upon it.

It may almost be said that this is rarely done as it ought to be in the manner that can be described as being good in every way for the purpose, and neatly done.

The bad manner of closing has been, more frequently than any other, the means of putting the whole instrument out of order, gradually distorting, if not actually bringing it to ruin as a work of art, and to destruction as a means of producing good musical sounds.

Judging by the ways adopted by many inferior grades of repairers, professional and amateur, the closing down of the upper table is thought to be a trifling matter and simply that of passing some glue on a brush rapidly round where the ribs are to come into contact with the table, clapping it down, placing the cramps round, screwing them tight, and, if the weather is cold, acting with more rapidity.

Ten minutes may be said to be the average time that this performance takes, and in the majority of cases is thought to be a good one.

But not so by a really competent, painstaking repairer. From his view this operation is to be one of the most cautiously conducted ones in the whole series of joinings in connection with the repairing or constructing of the violin.

As with other processes, there is more than one way of doing a thing and that well.

I recollect in early days being acquainted with an exceeding dexterous amateur in cabinet making, the principal part of whose furniture, in a large house, was his own individual and unaided workmanship. He also combined with this the making of violins, and of them I have a recollection of their exceedingly neat workman-

ship, being, in fact, ahead in that respect of many professional makers of the time. I often received from him hints as to the best methods of overcoming many little mechanical difficulties.

Once I was telling him about the dexterous manipulation required in fixing accurately and swiftly the upper table. There was the difficulty of getting perhaps the two end parts in position and fixing with sufficient rapidity before the glue had stiffened or set at the other parts.

He asked me why I wanted "to do this all at once, instead of a part at a time? He never did it."

He then proceeded to show me that the glue might be applied to the two end blocks and the corresponding parts of the table that were to be affixed, and these cramped exactly and with comparative ease, in their proper position. This being done, a very thin worn table knife could be used for working in glue at the other parts and the cramping down proceeded with as before.

Another way suggested itself to me some time after, which in careful hands would be still more adapted for accurate fitting. It is as follows:—Having seen that the opposing surfaces or parts that are to be affixed to each other are quite level, fit each other, have been cleaned and are free from any oiliness or greasy particles, the glue is neatly brushed round the parts requiring it, both upper table and ribs being treated. The corner and end blocks, if new, will require more than one coating, and these to be allowed to dry, as the end of the grain is very absorbent.

Assuming that the glue is sufficient in quantity all round, it may be allowed to dry.

The upper table can now be tested for a good fit by laying it, and noticing whether the marginal projection over the ribs is regular or not; in some instances a little humouring or averaging of this projection has to be made, especially when the instrument is very old, and bears evidence of much trouble under the hands of repairers of different degrees of skill, experience and patience.

This being found satisfactory, a slight brushing of thin glue over the upper and lower end blocks will be enough before placing the table in position and cramping them down.

For the other parts the thin knife will be sufficient, wetted and worked between, the cramps being applied as before.

This way of closing up dispenses with all cause for hurry. The exact amount of glue can be calculated without danger of over-loading, and the next necessary opening for repairs can be effected without the least risk of damage to the margin of the upper table. By this method there is no occasion for wiping superfluous glue from underneath the over-lapping edge, as there will not be any perceptible, or, indeed, present, when tidily done.

Sufficient time being allowed for drying—a little longer for the end blocks, these being more hidden and slowly affected by the atmosphere—the cramps may be removed.

As a final process, the varnishing over the parts that have been repaired may be touched upon.

The success of this so much depends upon the natural talent of the operator for matching colours and mixing of different gums for obtaining as close as possible resemblance to the surrounding work, that any hard and fast rules concerning it cannot be laid down.

An alcoholic mixture is almost invariably used for the covering of raw repairs, time scarcely ever being available for the use of an oil varnish.

The most commonly used basis is a lac varnish. The ease with which this is dissolved and manipulated is a temptation to use it at times when it would be the least desirable for the imitation of old varnish. One great fault in connection with it is its retaining a glare on the surface when hardened, and the undesirable aspect is given of polished spots where repairs have been going on. There is only one way of counteracting this—by mixing other gums or resins that have less or but little glare

when hard. Those of a very astringent quality should be avoided, as when dry their pulling power or contraction is very great, and a cracked surface not at all like the rich fused appearance of many of the old masters, but dry and uninteresting, will make itself too evident.

By a carefully-calculated mixture of soft and hard gums, with a little transparent colouring matter when necessary, a very good if not highly successful imitation of the surrounding work can be accomplished, such as will prevent the repair "catching the eye" too soon, for it must do so eventually when hunted for. The density of colouring and thickness of the principal component parts must always be studied, as the same depth of tint by a very thin layer as that of a thick one will not have the same effect, and one or the other, when making a contrast with the adjacent old surface, will be conspicuous as a failure.

A few hints may be acceptable as to material and the management of it. We will assume, for instance, that a portion of the upper table of a rather deep brown-red old master has been repaired, and a slice of comparatively light coloured or new wood has been inserted as a necessity, the grain as a matter of course having been matched to the best of the ability of the repairer.

The first step taken will be that of putting a nice clean even surface over the fresh wood, and in such a manner, that on passing the hand or finger over it, no lumps, edges, or rough spots are felt. Having brushed the dust or powdered wood away, the colour of the wood will have to be lowered or subdued, otherwise the whiteness will obtrude itself and stare through any carefully selected varnish. This, for good effect, will be found advisable with the repairing of any old instrument.

The precautions to be taken at this stage are respecting the quality or disposition of the stain (as we may call it). The stains ordinarily sold for colouring wood are quite useless for present purposes, as they are absorbed between the threads, leaving these by contrast very light and the reverse of what is desirable.

A very weak solution in water of bichromate of potash will lower the colour sufficiently for most purposes, and when quite dry the wood will (having swelled with the moisture) require the fine glass-papering again, after which, the next stage can be proceeded with.

The solution of nitric acid in water should be avoided, as, although giving a fairly good lowering of the tint, it destroys the soft parts of the wood, and, further, causes an odour that may cause annoyance to the musician and suspicion to the expert.

Another solution may be recommended, that of the black liquorice, which is a transparent brown, and naturally hard. Judgment will have to be exercised in the management of either of the above solutions that they are not put on too heavily.

The staining being effected, a slight coat of a diluted or light tint of the upper or deeply coloured varnish may be painted over and left to dry.

If time is not an important item for consideration, a turpentine varnish may be applied.

An excellent first colouring can be effected with the transparent preparation of gamboge. This material has for long, perhaps always, been in request for coloured varnish, as it can be used with (after due preparation) either alcohol, turpentine or oil. If dissolved in the last, the drying will take so long as to be practically useless to the repairer. The turpentine solution is more rapid, but not sufficiently so for the restorer under ordinary circumstances.

It will be therefore plain that an alcoholic solution of gums or resins will have to be relied on for obtaining the best results when time is limited.

The solution of gamboge in alcohol is, when used alone, too weak or insufficient in body; it is therefore advisable to incorporate with it some other material of a resinous or gummy nature, but such as will not impair the transparency. Among the most useful are the bleached or white shellac. This, as it leaves the manufactory, is not always in a condition for immediate use by the restorer;

it should be washed in water and then dried well, pounded up and placed in a bottle with about four-fifths of alcohol; after remaining in solution for some days the clear portion can be poured into another bottle and retained for use.

This, when used alone in its colourless condition, will possibly have, when dry, too much glare upon its surface, but the colouring matters put into it may oppose this sufficiently.

The use of a little gum guacum in solution will be found occasionally advantageous; this gum is fairly hard and will lower the colour and prevent too much of an approach to gaudiness, that is, if a highly coloured varnish has been found necessary. When it is desirable to dispense with lac of any kind in the varnish, other materials can be found that will perhaps answer the purpose as well, if not better; a solution of benzoin has no colour sufficient in itself and therefore may be used as a priming or mixing with the gamboge or with dragon's blood if that is desirable; the latter, like the gamboge, requires something to give it body.

Dragon's blood will soon let the operator know that its power of colouring to a staring degree will require suppression. To lessen its strength the following may be taken as an excellent means, and will reduce the violence *ad libitum*. With a lighted candle, wax for preference, smoke a piece of clean glass, and with a camel hair brush remove the black and stir it carefully with the coloured varnish. Care must be taken that too large a quantity is not put in, or an unpleasant tone, even blackness, will be the result.

With regard to the strength of the red, the same precautions must be taken: on comparing the varnish of a very red old master of Italy, say a Landolphi, with some made with a fairly strong solution of resin and dragon's blood, the violence of colour in the latter will be very apparent. At a little distance off the old master will look very modest while the other will seem coarse and vulgar.

For softening purposes a very small quantity of gum thrus may be used, too much will result in tackiness.

For hardening, sandarac has its place and usefulness, although, as with the naturally soft gums and resins which return to their original condition after the solvent has evaporated, great care must be taken to use a very small proportion.

A mixture of sandarac and shellac will result in an extremely hard and almost insoluble varnish, a very undesirable covering for a musical instrument of any kind as it wears badly, that is, suddenly and harshly with a rough fractured edge, instead of the gentle thinning-away under usage, seen with a delicate yielding material.

Acroydes is an Australian "grass gum," with very little recommendation, as in any considerable amount, it impairs the transparency of the other gums with which it may be mixed.

For a brown colour, a little burnt sugar will give a good tint, although too much will spoil the consistency of the other ingredients, and the whole will be easily affected by damp. Aloes, of which there are several kinds, have been used as a colouring ingredient, but the results are not on the whole to be considered as good.

Of the different lacs, or as it ought to be termed, condition of the resin, as they are all from the same source, seed lac and garnet lac, in proportion with other resins, will be found to have considerable colouring matter and requiring very little in addition.

For our present purposes, those of varnishing fresh parts of injured violins, the above mentioned component materials will be found, when in good proportion, according to the experience of the operator, to be nearly all that would be desirable in imitating the surrounding work.

There is nothing that can be suggested to enable a careless or incompetent repairer to achieve good results without care or calculation, and these two are an absolute necessity when the repair and restoration of a violin at all worthy of the name is the subject in hand. Innumerable effects may be obtained by changing the proportion of groundwork or priming, and top or coloured varnish. As the celebrated old Italian varnish was not one kind but

very many different kinds, it is more than probable that the different results obtained by the celebrated liutaros consisted to a greater extent in the manner of the application than any wonderful quality of material. Of this subject much might be written which would fil many times over the capacity of our present volume.

A few words more may be said in conclusion regarding the varnishing of new work on old violins; it must not be supposed that for the imitation of the surrounding work an exact repetition of the old Italian process with the identical substances used by the liutaros would be absolutely necessary for perfect or near success; it must be borne in mind that old varnish near the spot with its partial decay, probably from many causes, has to be imitated, and that what would be a great success with regard to a small space, might in all probability prove a signal failure when the whole instrument is so treated.

As a final stage, a freshly varnished portion (and over newly inserted wood), will require a little rubbing down (as it is termed); this may be done with some of the finest and worn glass-paper, finely ground pumice and oil, with a last turn of tripoli powder or rotten stone with oil. This should be done only when the varnish is quite dry and hard.

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